

MMAC-Plus - Chassis View : MMAC-Plus Chassis

File Chassis View Options Help

Name: Cabletron 9H422-12 Rev 01.03.01 IP Address:

Location: Test Lab Up Time: 29 Days 02:54:11

COM 1 COM 2 EPIM LCD

1	2	3	4	5	6	7	8	9	10	11	12	13	14	Status
Bridge	Bridge		Bridge	Bridge	Bridge	Bridge	Bridge	Bridge	Bridge	IF	IF			FNB1
1 FWD	1 FWD		1 FWD	1 FWD	1 FWD	1 FWD	1 FWD	1 FWD	1 FWD	1 OFF	1 OFF			FNB2
2 FWD	2 FWD		2 FWD	2 FWD	2 FWD	2 FWD	2 FWD	2 FWD	2 DIS	2 OFF	2 OFF			
3 FWD	3 FWD		3 FWD	3 FWD	3 FWD	3 FWD	3 FWD	3 FWD	3 OFF	3 OFF	3 OFF			
4 FWD	4 FWD		4 FWD	4 FWD	4 FWD	4 FWD	4 FWD	4 FWD	4 OFF	4 OFF	4 OFF			
5 FWD	5 FWD		5 FWD	5 FWD	5 FWD	5 FWD	5 FWD	5 FWD	5 OFF	5 ON	5 ON			
6 FWD	6 FWD		6 FWD	6 FWD	6 FWD	6 FWD	6 FWD	6 FWD	6 OFF	6 OFF	6 OFF			SMB1
7 FWD	7 FWD		7 FWD	7 FWD	7 FWD	7 FWD	7 FWD	7 FWD	7 OFF	7 OFF	7 OFF			SMB10
8 FWD	8 FWD		8 FWD	8 FWD	8 FWD	8 FWD	8 FWD	8 FWD	8 OFF	8 OFF	8 OFF			
9 FWD	9 FWD		9 FWD	9 FWD	9 FWD	9 FWD	9 FWD	9 FWD	9 OFF	9 OFF	9 OFF			
10 FWD	10 FWD		10 FWD	10 FWD	10 FWD	10 FWD	10 FWD	10 FWD	10 ULK	10 FWD	10 FWD			
11 FWD	11 FWD		11 FWD	11 FWD	11 FWD	11 FWD	11 FWD	11 FWD	11 ULK	11 FWD	11 FWD			
12 FWD	12 FWD		12 FWD	12 FWD	12 FWD	12 FWD	12 FWD	12 FWD	12 FWD	12 FWD	12 FWD			
13 FWD	13 FWD		13 FWD	13 FWD	13 FWD	13 FWD	13 FWD	13 FWD	13 FWD	13 FWD	13 FWD			
		FDDI	FDDI	FDDI	Enet 1									
		1 CON	1a ACT	1a ---	1 ON									
		2 CON	1b ACT	1b ---	2 ON									
		3 CON			3 ON									
		4 CON			4 ON									
		5 CON			5 ON									
		6 CON												
		7 CON												
		8 ACT												

Slot IP 132.177.118.24

Cabletron Systems

MMAC-Plus™ Remote Management for the
 9E312™ Ethernet Switch Module and
 9E423™ Series Ethernet SmartSwitch Module

Notice

Cabletron Systems reserves the right to make changes in specifications and other information contained in this document without prior notice. The reader should in all cases consult Cabletron Systems to determine whether any such changes have been made.

The hardware, firmware, or software described in this manual is subject to change without notice.

IN NO EVENT SHALL CABLETRON SYSTEMS BE LIABLE FOR ANY INCIDENTAL, INDIRECT, SPECIAL, OR CONSEQUENTIAL DAMAGES WHATSOEVER (INCLUDING BUT NOT LIMITED TO LOST PROFITS) ARISING OUT OF OR RELATED TO THIS MANUAL OR THE INFORMATION CONTAINED IN IT, EVEN IF CABLETRON SYSTEMS HAS BEEN ADVISED OF, KNOWN, OR SHOULD HAVE KNOWN, THE POSSIBILITY OF SUCH DAMAGES.

Virus Disclaimer

Cabletron has tested its software with current virus checking technologies. However, because no anti-virus system is 100% reliable, we strongly caution you to write protect and then verify that the Licensed Software, prior to installing it, is virus-free with an anti-virus system in which you have confidence.

Cabletron Systems makes no representations or warranties to the effect that the Licensed Software is virus-free.

Copyright © 1996 by Cabletron Systems, Inc. All rights reserved.

Printed in the United States of America.

Order Number: 9031630-02 November 1996

Cabletron Systems, Inc.
P.O. Box 5005
Rochester, NH 03866-5005

Cabletron Systems, SPECTRUM, BRIM, DNI, FNB, INA, Integrated Network Architecture, LANVIEW, LANVIEW Secure, Multi Media Access Center, MiniMMAC, and TRMM are registered trademarks, and **Bridge/Router Interface Modules, BRIM-A100, CRBRIM-W/E, CRXMIM, CXRMIM, Desktop Network Interface, Distributed LAN Monitoring, Distributed Network Server, DLM, DNSMIM, E1000, E2000, E3000, EFDMMIM, EMM-E6, EMME, EPIM, EPIM-3PS, EPIM-A, EPIM-C, EPIM-F1, EPIM-F2, EPIM-F3, EPIM-T, EPIM-T1, EPIM-X, ESXMIM, ETSMIM, ETWMIM, FDCMIM-04, FDCMIM-08, FDMIM, FDMIM-04, Flexible Network Bus, FOMIM, FORMIM, HubSTACK, IRBM, IRM, IRM-2, IRM-3, Media Interface Module, MicroMMAC, MIM, MMAC, MMAC-3, MMAC-3FNB, MMAC-5, MMAC-5FNB, MMAC-8, MMAC-8FNB, MMAC-M8FNB, MMAC-Plus, MRX, MRXI, MRXI-24, MultiChannel, NB20E, NB25E, NB30, NB35, NBR-220/420/620, RMIM, SecureFast Packet Switching, SFPS, SPECTRUM Element Manager, SPECTRUM for Open Systems, SPIM-A, SPIM-C, SPIM-F1, SPIM-F2, SPIM-T, SPIM-T1, TPMIM, TPMIM-22, TPMIM-T1, TPRMIM, TPRMIM-36, TPT-T, TRBMIM, TRMM-2, TRMMIM, and TRXI** are trademarks of Cabletron Systems, Inc.

AppleTalk, Apple, Macintosh, and TokenTalk are registered trademarks; and Apple Remote Access and EtherTalk are trademarks of Apple Computer, Inc.

SmartBoost is a trademark of American Power Conversion

ST is a registered trademark and C++ is a trademark of AT&T

Banyan and VINES are registered trademarks of Banyan Systems, Inc.

cisco, ciscoSystems, and AGS+ are registered trademarks; and cBus, cisco Router, CRM, IGS, and MGS are trademarks of cisco Systems, Inc.

GatorBox is a registered trademark; and GatorMail, GatorMIM, GatorPrint, GatorShare, GatorStar, GatorStar GX-M, and XGator are trademarks of Cayman Systems, Inc.

CompuServe is a registered trademark of CompuServe Incorporated

X Window System is a trademark of Consortium, Inc.

CTERM, DECnet, and ULTRIX are registered trademarks; and DEC, DEC C++, DECnet-DOS, DECstation, VAX DOCUMENT, VMA, and VT are trademarks of Digital Equipment Corporation

Fore Systems, ForeRunner, and ForeRunner ASX-100 are trademarks of Fore Systems, Inc.

PC/TCP is a registered trademark of FTP Software, Inc.

HP OpenView is a registered trademark of Hewlett-Packard, Inc.

AIX, IBM, OS/2, NetView, and PS/2 are registered trademarks; and AT, Micro Channel, PC, PC-DOS, PC/XT, Personal Computer AT, Operating System/2, Personal System/2, RISC System/6000, and Workplace Shell are trademarks of International Business Machines Corporation

i960 microprocessor is a registered trademark; and Intel and Multichannel are trademarks of Intel Corporation

Microsoft, MS-DOS, and Windows are registered trademarks of Microsoft Corporation

Chameleon, ChameleonNFS, Chameleon 32, IPX/link, and NEWT are trademarks of NETMANAGE, Inc.

NetWare and Novell are registered trademarks; and Internetwork Packet Exchange (IPX), IPX, and Network File System (NFS) are trademarks of Novell, Inc.

Motif and MS are registered trademarks; and Open Software Foundation, OSF, OSF/1, and OSF/Motif are trademarks of The Open Software Foundation, Inc.

Silicon Graphics and IRIS are registered trademarks; and Indigo and IRIX are trademarks of Silicon Graphics, Inc.

NFS, PC-NFS, SPARC, Sun Microsystems, and Sun Workstation are registered trademarks; and OpenWindows, SPARCstation, SPARCstation IPC, SPARCstation IPX, Sun, Sun-2, Sun-3, Sun-4, Sun386i, SunNet, SunOS, SunSPARC, and SunView are trademarks of Sun Microsystems, Inc.

OPEN LOOK and UNIX are registered trademarks of Unix System Laboratories, Inc.

Ethernet, NS, Xerox Network Systems and XNS are trademarks of Xerox Corporation

ANNEX, ANNEX-II, ANNEX-IIe, ANNEX-3, ANNEX-802.5, MICRO-ANNEX-XL, and MICRO-ANNEX-ELS are trademarks of Xylogics, Inc.

MAXserver and Xyplex are trademarks of Xyplex, Inc.

Restricted Rights Notice

(Applicable to licenses to the United States Government only.)

1. Use, duplication, or disclosure by the Government is subject to restrictions as set forth in subparagraph (c) (1) (ii) of the Rights in Technical Data and Computer Software clause at DFARS 252.227-7013.

Cabletron Systems, Inc., 35 Industrial Way, Rochester, New Hampshire 03867-0505.

2. (a) This computer software is submitted with restricted rights. It may not be used, reproduced, or disclosed by the Government except as provided in paragraph (b) of this Notice or as otherwise expressly stated in the contract.
 - (b) This computer software may be:
 - (1) Used or copied for use in or with the computer or computers for which it was acquired, including use at any Government installation to which such computer or computers may be transferred;
 - (2) Used or copied for use in a backup computer if any computer for which it was acquired is inoperative;
 - (3) Reproduced for safekeeping (archives) or backup purposes;
 - (4) Modified, adapted, or combined with other computer software, provided that the modified, combined, or adapted portions of the derivative software incorporating restricted computer software are made subject to the same restricted rights;
 - (5) Disclosed to and reproduced for use by support service contractors in accordance with subparagraphs (b) (1) through (4) of this clause, provided the Government makes such disclosure or reproduction subject to these restricted rights; and
 - (6) Used or copied for use in or transferred to a replacement computer.
 - (c) Notwithstanding the foregoing, if this computer software is published copyrighted computer software, it is licensed to the Government, without disclosure prohibitions, with the minimum rights set forth in paragraph (b) of this clause.
 - (d) Any other rights or limitations regarding the use, duplication, or disclosure of this computer software are to be expressly stated in, or incorporated in, the contract.
 - (e) This Notice shall be marked on any reproduction of this computer software, in whole or in part.

Chapter 1 Introduction

Using the 9E312 and 9E423 User's Guide	1-2
Related Manuals.....	1-3
Software Conventions	1-4
Common 9E312 and 9E423 Window Fields	1-4
Using Buttons and Menus	1-5
Getting Help	1-6
Using On-line Help.....	1-6
Getting Help from Cabletron Systems Technical Support.....	1-6
9E312 and 9E423 Firmware.....	1-7

Chapter 2 The 9E312/9E423 Module View

Viewing Module Information.....	2-2
Front Panel Information.....	2-3
Menu Structure.....	2-4
The 9E312/9E423 Module Port Status Display	2-7
The Chassis Manager Window	2-8
Viewing the Device Type	2-9
Managing the Module.....	2-9
Setting the Device Date and Time	2-9
Enabling and Disabling Bridge Ports.....	2-11
Using the Find Source Address Feature	2-11
I/F Summary Information.....	2-12
Interface Description Fields.....	2-13
Interface Performance Statistics/Bar Graphs	2-14
Interface Detail Window	2-15
Interface Detail Window Statistics	2-16
Making Sense of Interface Statistics.....	2-18
Testing and Disabling the Current Interface.....	2-18
Using the Applications Pull-down menu.....	2-19

Chapter 3 9E312/9E423 Module Bridging

Bridging Basics	3-1
More on Transparent Bridging	3-2
An Overview of Remote Bridge Management.....	3-2
The Bridge Status Window	3-3
Bridge Status Window Information Fields.....	3-4
Accessing Other Management Options from the Bridge Status Window	3-5
Enabling and Disabling Bridging	3-6
Bridge Statistics	3-6
Performance Graphs	3-7
Bridge Performance Graph Window Fields.....	3-8
Configuring the Bridge Performance Graphs.....	3-9
The Interface Statistics Window.....	3-9
Interface Statistics Window Fields	3-10
Bridge Spanning Tree.....	3-11
Configuring the Bridge Spanning Tree Window	3-13
Bridge Level Fields	3-13
Bridge Port Level Fields	3-15
Changing Bridge Spanning Tree Parameters	3-17
Changing Bridge Priority	3-17
Changing the Spanning Tree Algorithm Protocol Type	3-17
Changing Hello Time	3-18
Changing Max Age Time	3-18
Changing Forwarding Delay Time.....	3-18
Changing Port Priority.....	3-19
Changing Path Cost.....	3-19
Filtering Database	3-19
Filtering Database Window Fields	3-22
Configuring the Filtering Database	3-23
Altering the Ageing Time	3-24
Changing the Type of Entry	3-24
Changing the Receive Port	3-24
Changing the Port Filtering Action	3-25
Adding or Deleting Individual Entries.....	3-25
Clearing All Permanent, Static, or Dynamic Entries.....	3-26
Using Port Source Addressing	3-26
Setting the Ageing Time.....	3-27
Duplex Modes.....	3-28
The Duplex Modes Window.....	3-28
Duplex Modes Window Fields	3-29
Setting the Duplex Mode	3-30

Index

Introduction

How to use this guide; related guides; software conventions; getting help; 9E312 and 9E423 firmware versions

Welcome to the Cabletron Systems *MMAC-Plus Remote Management for the 9E312™ Ethernet Switch Module and 9E423™ Series Ethernet SmartSwitch Modules User's Guide*. We have designed this guide to serve as a simple reference for using SPECTRUM Element Manager for the 9E312-12 Ethernet Switch Module, and the 9E423-24 and 9E423-36 Ethernet SmartSwitch Modules for the MMAC-Plus. These modules provide Ethernet connectivity to the Internal Network Bus (INB) backplane via high-speed packet switching.

In basic terms, a packet-switching device provides forwarding logic for packets incoming or outgoing on two or more network interfaces on the device. The forwarding logic on Cabletron's MMAC-Plus architecture devices is based on three separate modes:

- Traditional 802.1d bridging based on physical layer address information.
- Traditional IP Routing based on logical layer address information.
- SecureFast™ Switching, which is high-performance switching based on source and destination MAC (physical) layer addresses. Packets received from a source address on a module's protocol-dependent front panel network are converted into fixed-length, protocol-independent packets for transmission across a backplane, and then are re-converted at the destination device into the appropriate physical frame format for reception by the destination address. Future firmware and management software enhancements will allow an administratively defined connection-policy between end stations connected to SecureFast Switching devices.

The INB is the Cabletron-proprietary network bus for protocol-independent, high-speed packet or cell switching between connectivity modules that support front-panel Ethernet, FDDI, Token Ring, or ATM networks. The connectivity modules incorporate Cabletron's SecureFast Switch (SFS) technology to provide high-performance packet switching based on source and destination MAC addresses, rather than on internet protocol (IP) addresses. By basing packet

switching on physical layer information, the INB allows your network infrastructure to be protocol independent. The INB backplane consists of two channels (INB-1 and INB-2), each featuring a 64-byte wide data path capable of a sustained data transfer rate of 2 Gigabytes/second (4 Gigabytes/second for the combined channels). Currently, the connectivity modules will connect to one or the other channel.

The 9E312-12 Ethernet Switch Module is Cabletron's first generation Ethernet INB module, and it is currently being field-upgraded to the 9E423. The device should be considered a prototype device for the INB, and management support for it should also be considered preliminary. The 9E312 supports thirteen network interfaces; one interface (Interface 1) to direct traffic over onto INB-1 of the MMAC-Plus Internal Network Bus (INB); and twelve RJ-45 10Base-T connectors.

The 9E423-24 Ethernet SmartSwitch™ Module is the second generation Ethernet INB module. It incorporates fast ASIC (application-specific integrated circuit) technology that boosts the forwarding rate of the module up to 750,000 frames per second. The 9E423-24 supports twenty-five network interfaces: one interface (Interface 1) to the INB-2 backplane, and two front panel RJ71 Telco connectors, each supplying 12 network interfaces via UTP or STP connectors. The 9E423 also incorporates an ASIC specially designed for embedded network trend and analysis tools.

The 9E423-36 Ethernet SmartSwitch module is similar to the 9E423-24, except that it supports thirty-seven network interfaces: one interface to INB-2, and three front panel RJ71 Telco connectors, each supplying 12 network interfaces via UTP or STP connectors.

Management is not available for either the INB 1 or INB 2 backplane, as data transmission across the INB is subject to hardware defaults.

The SecureFast Virtual Networking (SFVN) feature of the 9E423-24 and 9E423-36 (which allows switching configuration on a per-user level) is also not supported in firmware at the time this document was published. SFVN firmware is anticipated to be customer-released in late-1996, and remote management will follow shortly thereafter.

Using the 9E312 and 9E423 User's Guide

Each chapter in this guide describes one major functionality or a collection of several smaller functionalities of the 9E312 or 9E423 Modules. This guide contains information about software functions which are accessed directly from the module's Module View (either started from within MMAC-Plus Remote Management, or from a stand-alone icon representing the module).

For information about management functions which are accessed via the SPECTRUM Element Manager platform, consult the *Installing and Using SPECTRUM Element Manager* and *SPECTRUM Element Manager Utilities User's Guides*; for more information about monitoring and controlling a configured MMAC-Plus chassis, refer to the *Using MMAC-Plus Remote Management Guide*.

Because the management windows documented in this manual are similar for all three devices — except that the 9E423 modules support more interfaces, sample windows will be taken from 9E423-24 Module management (unless there is an exception in appearance for the 9E312 Module). Note, too, that the 9E423-24 and 9E423-36 Ethernet SmartSwitch Modules will be referred to collectively as the 9E423 Modules.

Chapter 1, **Introduction**, provides a list of related documentation, describes certain software conventions, and shows you how to contact Cabletron Systems Technical Support.

Chapter 2, **The 9E312 and 9E423 Module View**, describes the visual display of the 9E312 and 9E423 Modules and explains how to use the mouse within the Module View; the operation of several chassis-level management functions — such as changing the chassis display, enabling and disabling ports, and setting device date and time — is also described here, as are the I/F Summary windows, which provide information from the MIB-II Interface Group.

Chapter 3, **9E312 and 9E423 Bridging**, provides a comprehensive look at all management options associated with the bridge mode of the 9E312 and 9E423 switches, including Bridge Performance Graphs, Spanning Tree, the Filtering Database, and Duplex Mode operation. The bridge mode is currently implemented in the forwarding/filtering logic between the module's front panel networks and the interface to the INB backplane. When the modules support SecureFast networking, they will operate either in traditional bridge mode or SecureFast mode; the two modes cannot operate simultaneously.

We assume that you have a general working knowledge of Ethernet IEEE 802.3 type data communications networks and their physical layer components, and that you are familiar with general bridging concepts.

Related Manuals

The *MMAC-Plus Remote Management for the 9E312 Switch Module and 9E423 Series SmartSwitch Modules User's Guide* is only part of a complete document set designed to provide comprehensive information about the features available to you through SPECTRUM Element Manager. Other guides which include important information related to managing the 9E312 or 9E423 Modules include:

Cabletron Systems' *Using MMAC-Plus Remote Management Guide*

Cabletron Systems' *Installing and Using SPECTRUM Element Manager Guide*

Cabletron Systems' *SPECTRUM Element Manager Utilities User's Guide*

Cabletron Systems' *Network Troubleshooting Guide*

Microsoft Corporation's *Microsoft Windows User's Guide*

For more information about the capabilities of the 9E312 or 9E423 Modules, consult the appropriate hardware documentation.

Software Conventions

SPECTRUM Element Manager's device user interface contains a number of elements which are common to most windows and which operate the same regardless of which window they appear in. A brief description of some of the most common elements appears below; note that the information provided here is not repeated in the descriptions of specific windows and/or functions.

Common 9E312 and 9E423 Window Fields

Similar descriptive information is displayed in boxes at the top of most device-specific windows in SPECTRUM Element Manager, as illustrated in [Figure 1-1](#).

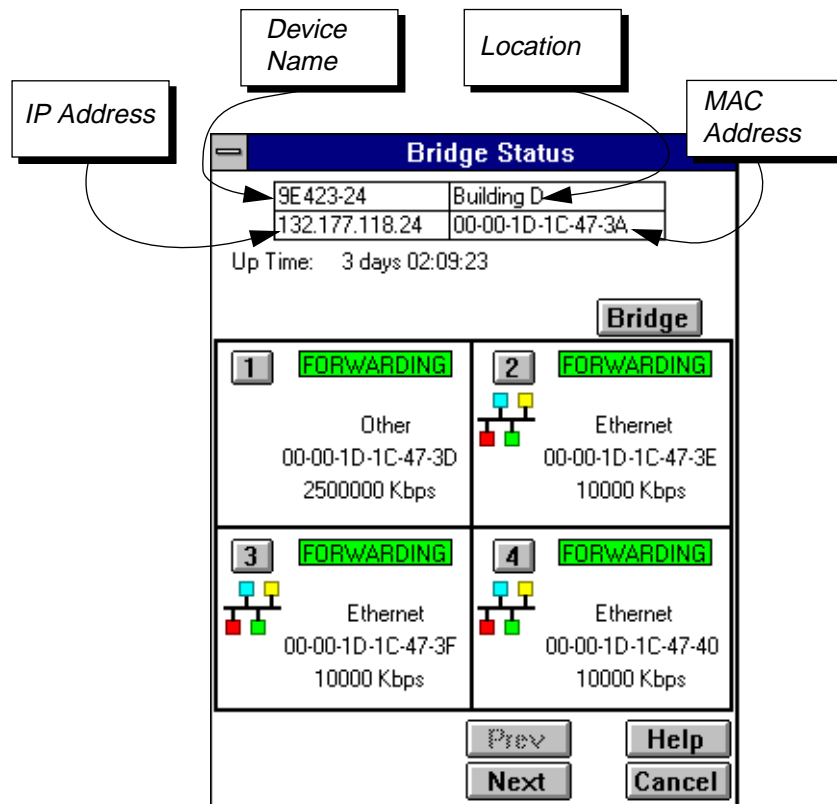


Figure 1-1. Sample Window Showing Informational Text Boxes

Device Name

Displays the user-defined name of the device. The device name can be changed via the System Group window; see the *Generic SNMP Management Module Guide for Windows* for details.

IP Address

The Internet Protocol address assigned to the 9E312 or 9E423 Module; this field will display the IP address you have used to create the 9E312 or 9E423 Module in the MMAC-Plus Chassis Setup window or to create its icon via SPECTRUM Element Manager. IP addresses are assigned via Local Management.

Location

Displays the user-defined location of the device. The location is entered through the System Group window; see the *Generic SNMP Guide* for details.

MAC Address

Displays the manufacturer-set MAC address of the interface through which SPECTRUM Element Manager is communicating with the 9E312 or 9E423 Module. MAC addresses are factory-set and cannot be altered.

Up Time


Displays the amount of time, in an X days hh:mm:ss format, that the 9E312 or 9E423 has been running since the last start-up.

Informational fields describing the ports being modeled are also displayed in most windows:

Port Number

Displays the number of the monitored port.

Using Buttons and Menus



This button, that appears at the bottom of most windows, lets you exit a window and terminate any unsaved changes you have made (if applicable).



Use these three buttons to save changes in a window and set them at the managed device (if applicable). You may also have to use the **Cancel** button to close a window after you have made changes and set them.



This button brings up a Help text box with information specific to the current window. For more information concerning Help buttons, see [Getting Help](#), later in this chapter.

Bridge **Other Groups**

Some buttons, like the two above, call up a menu listing the windows, screens, or commands available for that topic.

Any menu topic followed by ... (three dots) — for example **Statistics...** — calls up a window or screen associated with that topic.

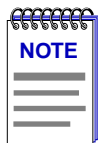
Getting Help

This section describes different methods of getting help for questions or concerns you may have while using SPECTRUM Element Manager.

Using On-line Help

You can use the 9E312 or 9E423 Module window **Help** buttons to obtain information specific to the device. When you click on a Help button, a window will appear which contains context-sensitive on-screen documentation that will assist you in the use of the windows and their associated command and menu options. Note that if a Help button is grayed out, on-line help has not yet been implemented for the associated window.

From the **Help** menu accessed from the Module View window menu bar, you can access on-line Help specific to the Module View, as well as bring up the Chassis Manager window for reference. Refer to Chapter 2 for information on the Module View and Chassis Manager windows.



*All of the SPECTRUM Element Manager help windows use the standard Microsoft Windows help facility; if you are unfamiliar with this feature of Windows, you can select **Help** —>**How to Use Help** from the Program Manager window, or consult your Microsoft Windows **User's Guide**.*

Getting Help from Cabletron Systems Technical Support

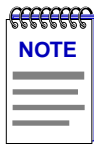
If you need support related to SPECTRUM Element Manager, or if you have any questions, comments, or suggestions related to this manual or any of our products, please feel free to contact Cabletron Systems' Technical Support via one of the following methods:

By phone:	Monday through Friday between 8 AM and 8 PM Eastern Standard Time at (603) 332-9400
By mail:	Cabletron Systems, Inc. PO Box 5005 Rochester, NH 03866-5005
By CompuServe®:	GO CTRON from any ! prompt
By Internet mail:	support@ctron.com
FTP	ftp.ctron.com (134.141.197.25)
Login	anonymous
Password	your email address
By BBS:	(603) 335-3358
Modem Setting	8N1: 8 data bits, 1 stop bit, No parity

For additional information about Cabletron Systems products, visit our World Wide Web site: <http://www.cabletron.com/>

9E312 and 9E423 Firmware

SPECTRUM Element Manager has been tested against customer release firmware versions up to 1.00.14 for both the 9E312 MMAC-Plus Ethernet Switch Module and the 9E423-24 MMAC-Plus Ethernet SmartSwitch Module, and up to the internal firmware version 1.03.01 for the 9E423-36 MMAC-Plus Ethernet SmartSwitch Module; if you have an earlier version of firmware and experience problems, contact Cabletron Systems Technical Support for upgrade information.



As a general rule, firmware versions for new products are liable to change rapidly; contact Cabletron Systems Technical Support for upgrade information for the latest customer release of firmware.

The 9E312/9E423 Module View

Accessing the Module View; information displayed in the Module View window; the logical module view — menu structure and information, the Port Status display, the Chassis Manager window, the Device Type window; module management functions — setting device date and time, enabling and disabling ports; I/F Summary and Detail information

The 9E312/9E423 Module View window is the main screen that immediately informs you of the status of your 9E312/9E423 Module via a color-coded, graphical display of the module's front panel that shows its individual ports in bridge mode. The Module View window serves as a single point of access to all other 9E312/9E423 Module windows and screens, which are discussed in the following chapter.


To open the 9E312/9E423 Module View window from the MMAC-Plus Chassis View:

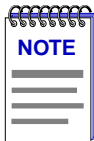
1. Click once on the 9E312/9E423 Module board index shown in the MMAC-Plus chassis to display a menu.
2. Select **Device View**, and the Module View window will appear.

You can also access the Module View from a 9E312/9E423 Module icon. Either double-click on the appropriate device icon (illustrated in [Figure 2-1](#), below) in a SPECTRUM Element Manager map or the Device List View, or use the following menu or tool bar options.



Figure 2-1. 9E312/9E423 INB Ethernet Switch Module Icons

1. Using the mouse, click on the **9E312/9E423 Module** icon to be monitored (in a map or the Device List View). The icon will be highlighted.
2. Select **Device** → **Manage** from the SPECTRUM Element Manager platform's menu bar, or select  from the tool bar; the Module View window will appear.



To model your 9E312/9E423 Module as an individual device from SPECTRUM Element Manager, you must make sure that you select **Chassis Manager** mode for launching the icon. Refer to your *Installing and Using SPECTRUM Element Manager Guide* for more information.

Viewing Module Information

The 9E312/9E423 Module View window (Figure 2-2) provides a graphic representation of the 9E312/9E423 Module, including a color-coded port display which immediately informs you of the current configuration and status of the module and its ports.

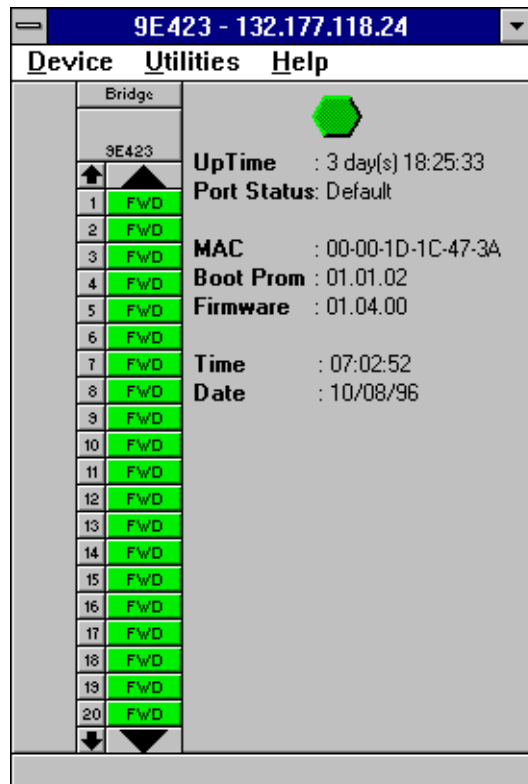
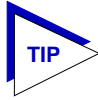



Figure 2-2. 9E312/9E423 Module View Window

By clicking in designated areas of the module's graphical display (as detailed later in this chapter), or by using the menu bar at the top of the Module View window, you can access all of the menus that lead to more detailed device- and port- level windows.

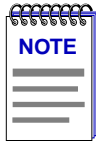


When you move the mouse cursor over a management "hot spot" the cursor icon will change into a "hand"  to indicate that clicking in the current location will bring up a management option.

Note also that there are scroll arrows at the top and bottom of the port stack of the 9E423 Modules' port display. Use these arrows to scroll through the port stack.

Front Panel Information

The areas above and to the right of the main module display area provide the following device information:



Preliminary versions of 9E312 module firmware may provide incomplete address information or firmware version information.

IP

The Internet Protocol address assigned to the 9E312/9E423 Module appears in the title bar of the Module View window; this will display the IP address you have used to create the 9E312/9E423 Module in the MMAC-Plus Chassis Setup window or to create its icon via SPECTRUM Element Manager. IP addresses are assigned via Local Management.

Connection Status

This color-coded area indicates the current state of communication between SPECTRUM Element Manager and the 9E312/9E423 Module.

- **Green** indicates the 9E312/9E423 Module is responding to device polls (valid connection).
- **Blue** indicates an unknown contact status — polling has not yet been established with the 9E312/9E423 Module.
- **Red** indicates the 9E312/9E423 Module is not responding to device polls (device is off line, or device polling has failed across the network for some other reason).

Up Time

The amount of time, in a day(s) hh:mm:ss format, that the 9E312/9E423 Module has been running since the last start-up.

Port Status

If management for your device supports a variable port display, this field will show the display currently in effect. If only a single port display is available — as is the case for the 9E312/9E423 Module — or if the default view is in effect, this field will state **Default**.

MAC

The physical layer address assigned to the interface through which SPECTRUM Element Manager is communicating with the 9E312/9E423 Module.

Unless your management station is communicating through the front panel of the module, this will reflect the MAC address of the SMB 10 interface on the module (to the 10 Mb/sec System Management Bus). MAC addresses are hard-coded in the device, and are not configurable.

Boot Prom

The revision of BOOT PROM installed in the 9E312/9E423 Module.

Firmware

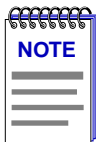
The revision of device firmware stored in the 9E312/9E423 Module's FLASH PROMs.

Time

The current time, in a 24-hour hh:mm:ss format, set in the 9E312/9E423 Module's internal clock.

Date

The current date, in an mm/dd/yy format, set in the 9E312/9E423 Module's internal clock.



You can set the date and time by using the *Edit Device Date* and *Edit Device Time* options on the Device menu, see [Setting the Device Date and Time](#), later in this chapter, for details.

Menu Structure

By clicking on various areas of the 9E312/9E423 Module View display, you can access menus with device- and port-level options, as well as utility applications which apply to the device. The following illustration displays the menu structure and indicates how to use the mouse to access the various menus:

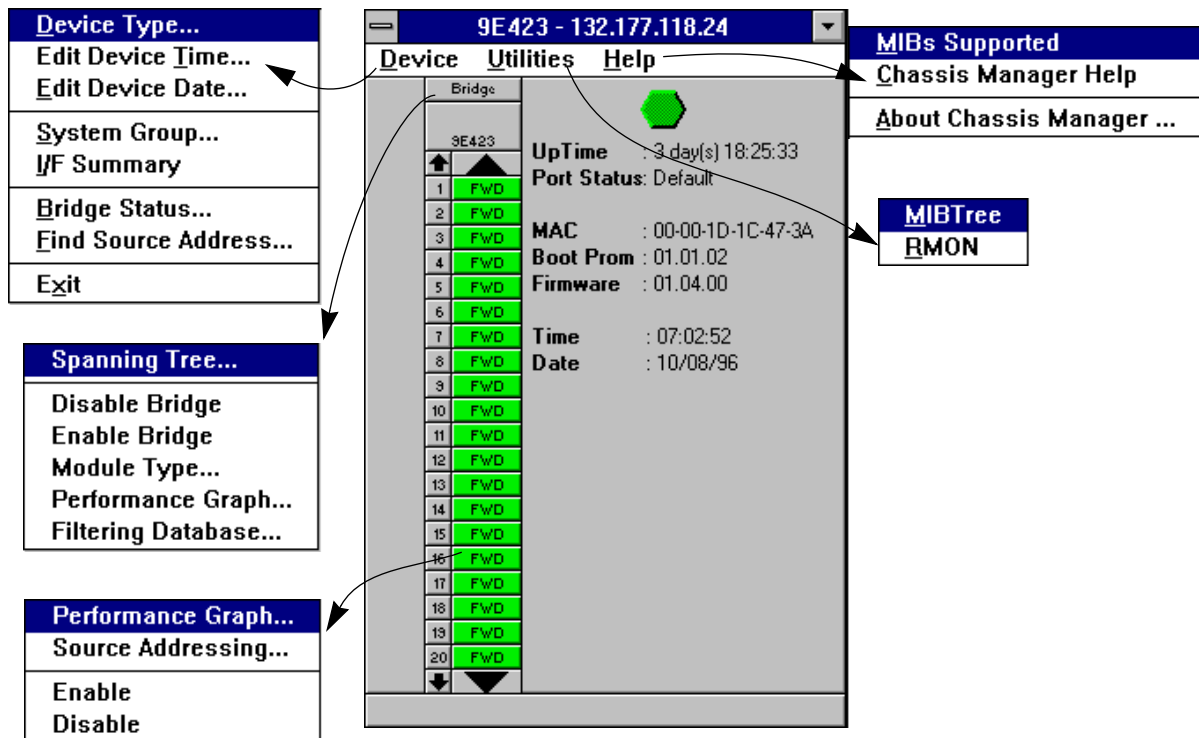


Figure 2-3. 9E312/9E423 Module View Menu Structure

The Device Menu

From the Device Menu at the Module View window menu bar, you can access the following selections:

- **Device Type...**, which displays a window containing a description of the device being modeled.
- **Edit Device Time...** and **Edit Device Date...**, which allow you to set the 9E312/9E423 Module's internal clock.
- **System Group...**, which allows you to manage the 9E312/9E423 Module via SNMP MIB II. Refer to the *Generic SNMP Management Module Guide for Window* for further information.
- **I/F Summary**, which lets you view statistics (displayed both graphically and numerically) for the traffic processed by each network interface on your device, including a detailed Transmit and Receive traffic breakdown for each interface. It also lets you access SNMP MIB-I and MIB-II windows for device management.
- **Bridge Status...**, which opens a window that provides an overview of bridging information for each port, and allows you to access all other bridge-related options. Refer to Chapter 3, **9E312/9E423 Module Bridging**, for more information.

- **Find Source Address...**, which opens a window that allows you to search the 802.1d Filtering Database of the 9E312/9E423 to determine which switching interface a specified source MAC address is communicating through. If the MAC address is detected as communicating through the switch, the port display will flash to indicate the switch interface of interest.
- **Exit**, which closes the 9E312/9E423 Module View window.

The Utilities Menu

The Utilities menu provides access to any utilities provided by SPECTRUM Element Manager for use with the 9E312/9E423 Module. These utilities include the MIBTree utility, which provides direct access to the 9E312/9E423 Module's MIB information, and the RMON utility, a remote monitoring utility which is implemented by many of Cabletron Systems' intelligent devices. These selections are also available from the Utilities menu at the top of SPECTRUM Element Manager's main window.

Refer to your *Utilities User's Guide* for information on these utilities.

The Help Menu

The Help Menu has three selections:

- **MIBS Supported**, which brings up the Chassis Manager window, described later in this chapter.
- **Chassis Manager Help**, which brings up a help window with information specifically related to using the Chassis Manager and Module View windows.
- **About Chassis Manager...**, which brings up a version window for the Chassis Manager application in use.

The Bridge Menu

The Bridge menu is available by clicking on the Bridge label above the bridge port display. It offers access to the following bridge-specific options, which are discussed thoroughly in Chapter 3, **9E312/9E423 Module Bridging**:

- **Spanning Tree...**, which lets you set the Spanning Tree Algorithm parameters for bridging on your 9E312/9E423 Module.
- **Disable/Enable Bridge**, which allows you to halt or start bridging across the device.
- **Module Type...**, which displays a window containing a description of the device being modeled.
- **Performance Graph...**, that displays a statistics window for traffic across the entire bridge.
- **Filtering Database...**, which displays a window to configure the 9E312/9E423 Module bridge's acquired and permanent filtering databases to filter or forward traffic across the 9E312/9E423 Module.

The Bridge Port Menu

The menu for the INB and Ethernet bridging interfaces offers three selections:

- **Performance Graph...**, which brings up a statistics window specific to the selected interface.
- **Source Addressing....**, which brings up a window allowing you to see which source addresses are communicating through a switch port when it is using 802.1d bridging. See **Using Port Source Addressing** in Chapter 3 for more information.
- **Enable** and **Disable**, which let you enable or disable bridging across the selected interface; see **Enabling and Disabling Bridge Ports**, later in this chapter.

The 9E312/9E423 Module Port Status Display

The port display on the 9E312/9E423 Module reflects device activity from a bridging perspective. The port text boxes beneath the **Bridge** label indicate the state of bridging on each switching interface supported by the 9E312/9E423.

For the 9E312, the port text box indexed "1" indicates the fixed interface to the INB-1 bus; interfaces indexed "2" through "13" indicate the front panel 10BASE-T Ethernet switching interfaces.

For the 9E423-24, the port text box indexed "1" indicates the fixed interface to the INB-2 bus; interfaces indexed "2" through "25" indicate the user-interfaces available through the two RJ71 Telco front panel connectors.

For the 9E423-36, the port text box indexed "1" indicates the fixed interface to the INB-2 bus; interfaces indexed "2" through "37" indicate the user-interfaces available through the three RJ71 Telco front panel connectors.

The bridge state at each port can be one of the following:

FWD (Forwarding)	(Green) The port is on-line and forwarding packets across the 9E312/9E423 from one network segment to another.
DIS (Disabled)	(Blue) Bridging at the port has been disabled by management; no traffic can be received or forwarded on this port, including configuration information for the bridged topology.
LRN (Learning)	(Magenta) The Forwarding database is being created, or the Spanning Tree Algorithm is being executed because of a network topology change. The port is monitoring network traffic, and learning network addresses.

LIS (Listening)	(Magenta) The port is not adding information to the filtering database. It is monitoring Bridge Protocol Data Unit (BPDU) traffic while preparing to move to the forwarding state.
BLK (Blocking)	(Orange) The port is on-line, but filtering traffic from going across the 9E312/9E423 from one network segment to another. Bridge topology information will be forwarded by the port.
BRK (Broken)	(Red) The physical interface has malfunctioned.

The Chassis Manager Window

Like most networking devices, Cabletron's devices draw their functionality from a collection of proprietary MIBs and IETF RFCs. In addition, Cabletron's newer intelligent devices — like the 9E312/9E423 Module — organize their MIB data into a series of "components." A MIB component is a logical grouping of MIB data, and each group controls a defined set of objects. For example, 9E312/9E423 Module bridging information is organized into its own component; more generic device and port information resides in the chassis component. Note, too, that there is no one-to-one correspondence between MIBs and MIB components; a single MIB component might contain objects from several different proprietary MIBs and RFCs.

The Chassis Manager window, [Figure 2-4](#), is a read-only window that displays the MIBs and the MIB components — and, therefore, the functionality — supported by the currently monitored device.

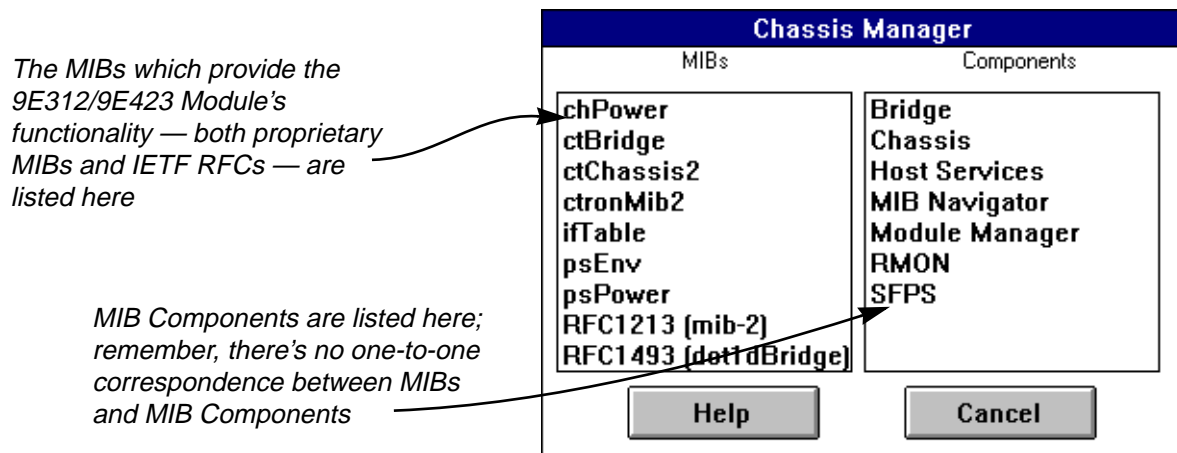


Figure 2-4. Chassis Manager Window

To view the Chassis Manager window:

1. Click on **H**elp on the menu bar at the top of the Module View window.
2. Drag down to **MIBs Supported**, and release.

Viewing the Device Type

In addition to the graphical displays described above, the **Device Type** option on the Device menu and the **Module Type** option on the Bridge menu bring up windows that list the physical characteristics of the 9E312 or 9E423 Module and its ports:

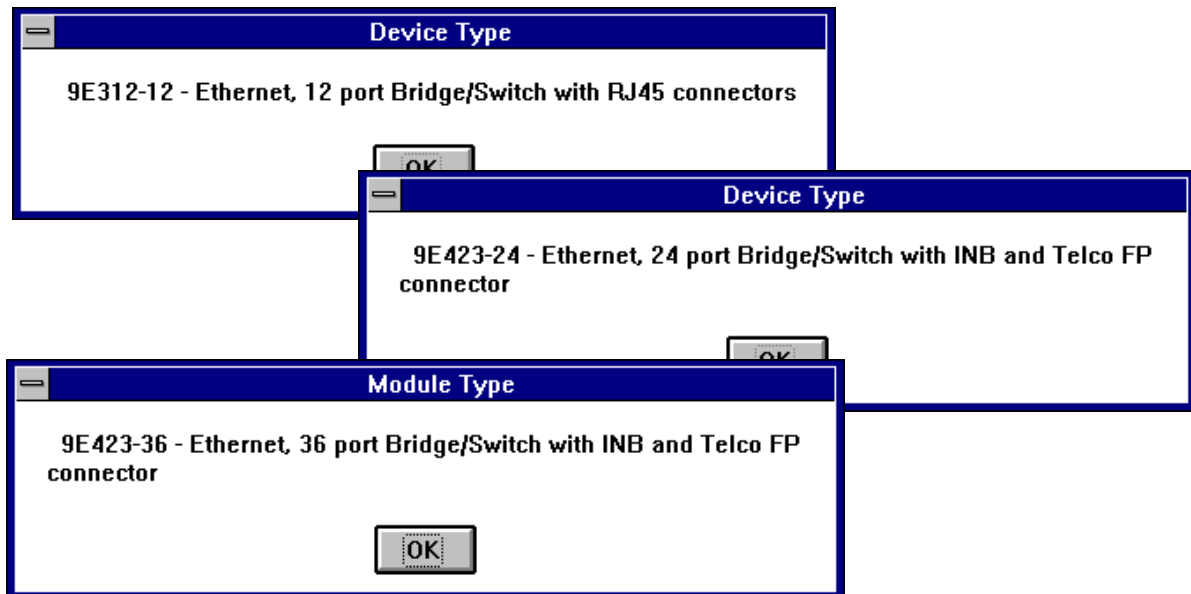


Figure 2-5. Device and Module Type Windows

Managing the Module

In addition to the performance and configuration information described in the preceding sections, the Module View also provides you with the tools you need to configure your module and keep it operating properly. Module management functions include setting device date and time and enabling and disabling ports.

Setting the Device Date and Time

You can select the **Edit Device Time** and **Edit Device Date** options from the Device menu to change the date and time stored in the device's internal clock.

To edit the device time:

1. Click on **D**evice on the Module View window menu bar to access the Device menu; drag down to **E**dit Device **T**ime..., and release. The following change window, [Figure 2-6](#), will appear.

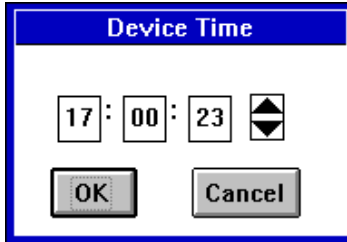


Figure 2-6. Edit Time Window

2. Enter the new time in a 24-hour hh:mm:ss format, either by highlighting the field you wish to change and using the up and down arrow buttons, or by simply entering the new value in the appropriate field.
3. Click on to save the changes, or on to exit without changes.

To edit the device date:

1. Click on **D**evice on the Module View window menu bar to access the Device menu; drag down to **E**dit Device **D**ate..., and release. The following change window, [Figure 2-7](#), will appear.

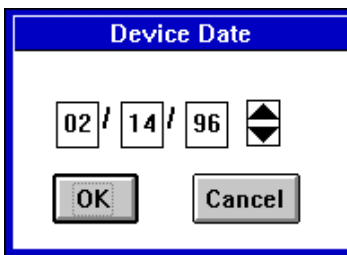


Figure 2-7. Edit Date Window

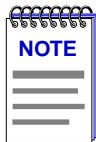
2. Enter the new date in a mm/dd/yy format, either by highlighting the field you wish to change and using the up and down arrow buttons, or by simply entering the new value in the appropriate field.
3. Click on to save the changes, or on to exit without changes.

Enabling and Disabling Bridge Ports

From the Module View, you can enable or disable bridging at the interfaces supported by your 9E312/9E423 module. When you disable bridging at a port, you disconnect that port's network from the bridge entirely. The port does not forward any packets, nor does it participate in Spanning Tree operations. Nodes connected to the network can still communicate with each other, but they can't communicate with the bridge or with other networks connected to the bridge. When you enable bridging at a port, the port moves from the Disabled state through the Learning and Listening states to the Forwarding state; bridge port state color codes will change accordingly.

To enable or disable bridging at a port:

1. Click on the appropriate Bridge Port status display text port box to bring up the bridge port menu.
2. Drag to select **Enable** or **Disable** as desired. Note that you will receive a warning message asking you to confirm your decision to disable a bridge port.



For more information about bridging functions and how to determine the current state of each bridge port, see Chapter 3, *9E312/9E423 Module Bridging*.



Before disabling bridging for any port, be sure that doing so will not sever your network connection.

You can also simultaneously enable or disable bridging at all switch ports on the device by using the Enable Bridge or Disable Bridge option. To do so:

1. Click on the **Bridge** label to bring up the bridge menu.
2. Drag to select **Enable Bridge** or **Disable Bridge** as desired. Again, you will receive a warning message asking you to confirm your decision.

Using the Find Source Address Feature

You can select the Find Source Address option to discover which switching interface a specified source MAC address is communicating through. When you select the Find Source Address option, a search is made of the 802.1d Bridge Filtering Database to discover the switch interface associated with the address

that you specify. If the search is successful, the corresponding interface will flash in the Module View window. For more information on the Filtering Database and bridging in general, refer to Chapter 3, **9E312/9E423 Module Bridging**.

Use the Find Source Address option as follows:

1. Click to display the **Device** pull-down menu.
2. Drag to **Find Source Address....** The following window will appear.

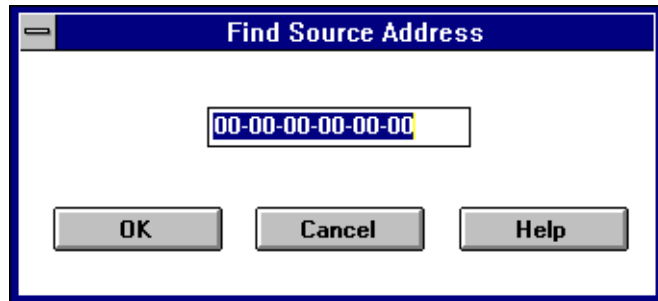


Figure 2-8. Find Source Address Window

3. In the text field in the middle of the window, enter a valid MAC address in Hex format and then click .

If the address is found in the 802.1d Bridge Filtering Database, the port through which the address is communicating will flash in the front panel Module View port display.

If the address is not found in the Filtering Database, a separate window will appear with a "Can't Find Source Address" message.

I/F Summary Information

The I/F Summary menu option, available from the Device menu, lets you view statistics (displayed both graphically and numerically) for the traffic processed by each network interface on your device (i.e., the interfaces returned by the SNMP MIB II Interfaces Group's ifTable). The window also provides access to a detailed statistics window that breaks down Transmit and Receive traffic for each interface. Finally, an Applications button in the I/F Summary window lets you access SNMP MIB-I and MIB-II windows for device management.

To access the I/F Summary window:

1. From the Module View, click on the **Device** option from the menu bar.
2. Drag down to **I/F Summary** and release. The I/F Summary window, [Figure 2-9](#), will appear.

I/F Summary						
9E423-24		UpTime: 3 days 20:24:15				
132.177.118.24		00-00-1D-1C-47-3A				
Index	Type	Description	P.Sta	L.Sta	In Octets	Load
1	sdlc	SMB 1	Online	Up		0.25 %
2	ethernet-csmacd	SMB 10	Online	Up		2.36 %
3	None	HOST	Online	Up		<.01 %
4	None	HOST	Online	Up		0.00 %
5	None	INB	Online	Up		0.01 %
6	ethernet-csmacd	Ethernet	Offline	Down		0.00 %
7	ethernet-csmacd	Ethernet	Offline	Down		0.00 %

Applications Detail Cancel Help

Figure 2-9. I/F Summary Window

When you open the I/F Summary window, you will see fields which describe each interface on your device, as well as a bar graph and statistics which display each interface's performance.

There is also an **UpTime** field. This field lists the amount of time, in a days, hh:mm:ss format, that the device has been running since the last start-up.

Interface Description Fields

The following fields are listed for each interface.

Index

The index value assigned to each interface on the device. This number must range between one and the total number of interfaces on the device.

Type

The type of the interface, distinguished by the physical/link protocol(s) running immediately below the network layer. Type can be sdlc (SMB 1), ethernet csmacd (SMB10 and front panel interfaces), or None (other undefined types for the Host CPU — the i960's network management component — and INB interfaces).

Description

A text description of the interface.

P. Sta

Displays the current operational state of the interface (its physical status). Possible operational states are **Online** or **Offline**.

L. Sta

Displays the current administrative status (logical status) of the interface. Possible administrative states are **Up** or **Down**.

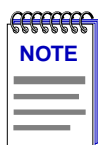
Interface Performance Statistics/Bar Graphs

With the statistics and accompanying bar graphs to the right of the interface description fields, you can view the performance of your device interfaces at one glance.

You can select the attributes of the statistics and graphs by using two menu buttons directly above the graphs. These menu buttons work in conjunction to determine what the statistics or graphs will display, as follows:

1. Click on the right menu button to select the base units to display in the statistics and graphs: **Raw Counts**, **Load**, or **Rate**.
2. Once you have selected the base units, click on the left menu button to specify further measurement parameters. (The options from this menu will vary depending on the base units you have selected.)

After you select a new display mode, the statistics and graphs will refresh to reflect the current choice, as described below.



Bar graphs are only available when Load is the selected base unit.

Raw Counts

The total count of network traffic received or transmitted on the indicated interface since device counters were last reset. Raw Counts are provided for the following parameters.

In Octets	Octets received on the interface, including framing characters.
In Packets	Packets (both unicast and non-unicast) received by the device interface and delivered to a higher-layer protocol.
In Errors	Packets received by the device interface that contained errors that prevented them from being delivered to a higher-layer protocol.
In Discards	Packets received by the device interface that were discarded even though no errors prevented them from being delivered to a higher layer protocol (e.g., to free up buffer space in the device).

In Unknown	Packets received by the device interface that were discarded because of an unknown or unsupported protocol.
Out Octets	Octets transmitted by the interface, including framing characters.
Out Packets	Packets transmitted, at the request of a higher level protocol, by the device interface to a subnetwork address (both unicast and non-unicast).
Out Errors	Outbound packets that could not be transmitted by the device interface because they contained errors.
Out Discards	Outbound packets that were discarded by the device interface even though no errors were detected that would prevent them from being transmitted. A possible reason for discard would be to free up buffer space in the device.

Load

The number of bytes processed by the indicated interface during the last poll interval in comparison to the theoretical maximum load of the network to which the device is connected (1 Mbps for SMB-1; 10 or 20 Mbps for Ethernet/Ethernet Full Duplex; and 2 Gbps for INB). Load is further defined by the following parameters.

In Octets	The number of bytes received in comparison to the theoretical maximum number of bytes received.
Out Octets	The number of bytes transmitted in comparison to the theoretical maximum number of bytes transmitted.

Rate

The amount of network traffic during the last poll interval that was processed by the indicated device interface. The available parameters are the same as those provided for Raw Counts. Refer to the Raw Counts section, above, for a complete description of each parameter.

Interface Detail Window

A Detail button at the bottom of the I/F Summary window invokes the Interface Detail window that allows you to view statistics for each interface on the device.

Statistics are gathered concerning network activity occurring at the physical and data-link layers. These statistics reflect the following types of packets being transmitted and received:

- Unicasts
- Multicasts
- Discarded Packets
- Error Packets
- Received Packets with unknown protocols
- Packets waiting to be transmitted
- Total Received and Transmitted Packets

To open the Interface Detail window from the I/F Summary window:

1. Click in the descriptive area for the desired interface in the list. The interface will be highlighted.
2. Click on **Detail**. An Interface Detail window will appear for that interface.

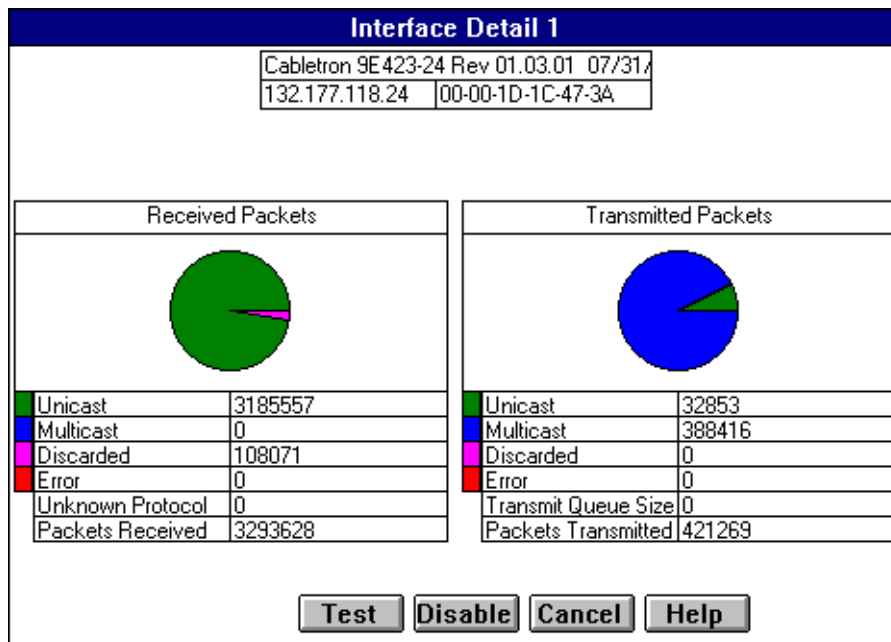


Figure 2-10. Interface Detail Window

Interface Detail Window Statistics

These following statistics are collected from received and transmitted packets and are displayed in the lower portion of the window. The first four (both transmit and receive) are also graphically displayed in the pie chart. The statistics are read directly from the device, and are updated with each poll from SPECTRUM Element Manager to the device.

Unicast

(ifInUcastPkts) "The number of subnetwork unicast packets received from a higher-layer protocol."

(ifOutUcastPkts) “The number of subnetwork unicast packets delivered to a higher-layer protocol.”

A unicast is a transmission sent to only one station. This field displays the number of unicasts received from, or transmitted to, a higher-layer protocol.

Multicast

(ifInNUcastPkts) “The number of non-unicast (i.e., subnetwork-broadcast or subnetwork multi-cast) packets received from a higher-layer protocol.”

(ifOutNUcastPkts) “The number of non-unicast (i.e., subnetwork-broadcast or subnetwork multi-cast) packets delivered to a higher-layer protocol.”

A multicast is a transmission which is simultaneously sent to more than one station at a time. This field displays the number of multicast packets (including broadcast packets) delivered to, or requested to be transmitted from, the higher-layer protocol.

Discarded

(ifInDiscards) “The number of inbound packets which were chosen to be discarded even though no errors had been detected to prevent their being transmitted. One possible reason for discarding such a packet could be to free up buffer space.”

(ifOutDiscards) “The number of inbound or outbound packets which were chosen to be discarded even though no errors had been detected to prevent their being deliverable. One possible reason for discarding such a packet could be to free up buffer space.”

Discarding good packets indicates a very busy network. If a device routinely discards packets it usually means that network traffic is overwhelming the device perhaps because the device is performing poorly.

Error

(ifInErrors) “The number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol.”

(ifOutErrors) “The number of outbound packets that could not be transmitted because of errors.”

A count of bad packets.

Unknown Protocol

(ifUnknownProtos) “The number of packets received via the interface which were discarded because of an unknown or unsupported protocol.”

A device discards a packet and increments this counter if it can't recognize the packet. This statistic appears only in the Input Table.

Transmit Queue Size

(ifOutQLen) “The length of the output packet queue (in packets).”

The number of packets currently queued by the device for transmission. The amount of device memory devoted to buffer space, and the traffic level on the target network determine how large the output packet queue can grow before the device begins to discard packets. This statistic applies only to the Output Table.

Packets Received

Displays the total number of inbound packets.

Packets Transmitted

Displays the total number of packets transmitted onto the network.

Making Sense of Interface Statistics

The statistics available in this window can give you an idea of how an interface is performing. By using the statistics in a few simple calculations, it's possible to get a sense of an interface's activity level.

To calculate the percentage of input errors:

- $\text{Received Errors} / \text{Packets Received}$

To calculate the percentage of output errors:

- $\text{Transmitted Errors} / \text{Packets Transmitted}$

To calculate the total number of inbound and outbound discards:

- $\text{Received Discards} + \text{Transmitted Discards}$

To calculate the percentage of packets discarded inbound

- $\text{Received Discards} / \text{Packets Received}$

To calculate the percentage of packets discarded outbound

- $\text{Transmit Discards} / \text{Packets Transmitted}$

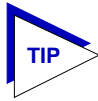
Testing and Disabling the Current Interface

With the Test button you can test the current interface (e.g., by performing a loopback or some other transmission test).

With the Test and Disable buttons, you can test or disable the current interface. The operational states of these two options are:

Test The interface will be in some test mode and no operational packets can be passed.

Disable The interface will be in a closed state.



The Test and Enable/Disable buttons attempt to set the ifAdmin Status OID to the Enable, Disable, or Test values. Not all device firmware will allow you to perform a SET of this MIB OID for all interfaces, so attempts to test or enable/disable an interface may result in a SET FAILED message.

To test the current interface:

1. Click on **Test**. The current interface will now be operating in the test state.

To disable the current interface:

1. Click on **Disable**. The current interface will now be operating in a closed state.

Using the Applications Pull-down menu

The Applications button leads you to a pull-down menu that indicates device-associated SNMP MIB-I or MIB-II functions that the device supports.

To access the Applications pull-down menu:

1. Using the mouse, click on **Applications**. A pull-down menu will appear with SNMP-MIB II options supported by the device; non-supported options will be grayed out.
2. Click on the desired option. The appropriate window will appear.

9E312/9E423 Module Bridging

Bridge management overview; the Bridge Status window — viewing the window, field definitions, enabling and disabling bridging; the Bridge Performance Graphs — field definitions, configuring the graphs, bridge detail breakdown, bridge port detail background; the Bridge Spanning Tree window — fields defined, changing bridge Spanning Tree parameters; the Filtering Database window — field definitions, configuring the filtering database; the Duplex Modes window — field definitions, setting the duplex mode; the port Source Addressing window

Bridging Basics

Your 9E312-12 and 9E423-XX Ethernet Switch modules have the ability to act as 802.1d Transparent Bridges to direct traffic between the network segments connected to their front panel and the interface to the INB backplane.

Bridges are used in local area networks to connect two or more network segments and to control the flow of packets between the segments. Ideally, bridges forward packets to another network segment only when necessary.

Bridges are also used to increase the fault tolerance in a local area network by creating redundant bridge paths between network segments. In the event of a bridge or bridge segment failure, an alternate bridge path will be available to network traffic, without significant interruption to its flow.

The method a bridge uses to forward packets, choose a bridge path, and ensure that a sending station's messages take only one bridge path depends on the bridge's type: Transparent (generally used in Ethernet or FDDI environments) or Source Routing (generally used in Token Ring environments).

Transparent bridging relies on a "Filtering Database" to make forwarding decisions. The source addresses of data coming into each bridge interface are read and stored in a Filtering Database that associates each address with the interface it was detected on. When a packet is received by the bridge, it can then compare the destination address of the packet to the addresses in the Filtering Database, and determine which bridge interface to send the packet to.

In Source Route bridging, the source node sends “explorer” packets to a destination node that pass through a bridged network. Each bridge that sees the explorer packet will append Routing Information (in the form of LAN segment numbers) to it. When the destination node receives these explorer packets, it will return a response to the source node that contains the route information field indicating which bridge paths the explorer packets took. In future communication between the two nodes, the original source node will append the best route to the destination node in a Routing Information Field (RIF) of its data frames, so that a bridge on the network will simply have to examine the RIF to verify whether it is a part of the route process.

More on Transparent Bridging

Transparent bridges are most common in Ethernet networks. Individual Transparent bridges monitor packet traffic on attached network segments to learn their network segment location in terms of which bridge port receives packets originated from a particular station (determined via the packet’s Source Address field). This information gets stored in the bridge’s Filtering Database. When in the Forwarding state, the bridge compares a packet’s destination address to the information in the Filtering Database to determine if the packet should be forwarded to another network segment or filtered (i.e., not forwarded). A bridge filters a packet if it determines that the packet’s destination address exists on the same side of the bridge as the source address.

Transparent bridges in a network communicate with one another by exchanging Bridge Protocol Data Units, or BPDUs, and collectively implement a Spanning Tree Algorithm (STA) to determine the network topology, to ensure that only a single data route exists between any two end stations, and to ensure that the topology information remains current.

An Overview of Remote Bridge Management

With SPECTRUM Element Manager, you can view and manage bridging across the 9E312/9E423 Module — and at each bridging interface — by using the following windows:

- The Bridge Status window provides you with basic information about the current status of the 9E312/9E423 Module’s bridging interfaces, and allows you to enable or disable bridging at each interface of the switch. The Bridge Status window also lets you access further windows to configure bridging at the 9E312/9E423 Module.
- The Performance Graph and Interface Statistics windows graphically display the traffic passing between bridged networks, and let you compare and contrast traffic processed by each interface.

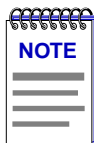
- The Spanning Tree window shows bridge port information and protocol parameters relating to the Spanning Tree Algorithm (the method of determining the controlling bridge when a series of bridges are placed in parallel).
- With the Filtering Database window, you can see the contents of the Static and Learned databases — the two address databases which construct the IEEE 802.1d Source Address Table. The switch uses the contents of these databases to make its packet filtering and forwarding decisions when using 802.1d bridging. You can configure entries in these databases to increase bridging efficiency across your network.
- The Port Source Addressing window displays the contents of the 9E312-12/9E423-24 switch's 802.1d Bridge Filtering Database with respect to a selected interface. This will display the source MAC addresses that have been detected by the interface as it forwards data across the network. The window also lets you set the ageing timer that controls how long an inactive MAC address will continue to be stored in the Source Address Database before being aged out.
- The Duplex Modes window lists each interface on your device and whether or not it is using Full Duplex mode. The window allows you to switch full duplex mode on and off for each interface on the device. Full Duplex Switched Ethernet (FDSE) mode allows the interface to transmit and receive information simultaneously.

The following sections detail how to use each of the bridge management windows.

The Bridge Status Window

The Bridge Status window provides you with basic information about the current status of bridging across your device. Color-coding of each port display allows you to quickly ascertain the status of each interface. The Bridge Status window also lets you access further windows to control bridging at your 9E312/9E423 Module. To access the Bridge Status window from the Module View window:

1. Click on the **D**evice selection in the menu bar. A pull-down menu will appear.
2. Click on **B**ridge Status.... The Bridge Status window, [Figure 3-1](#), will appear.



Preliminary versions of 9E312 firmware identify the INB port (Port 1) as being an FDDI type port. This is incorrect, as the INB is not an FDDI bus.

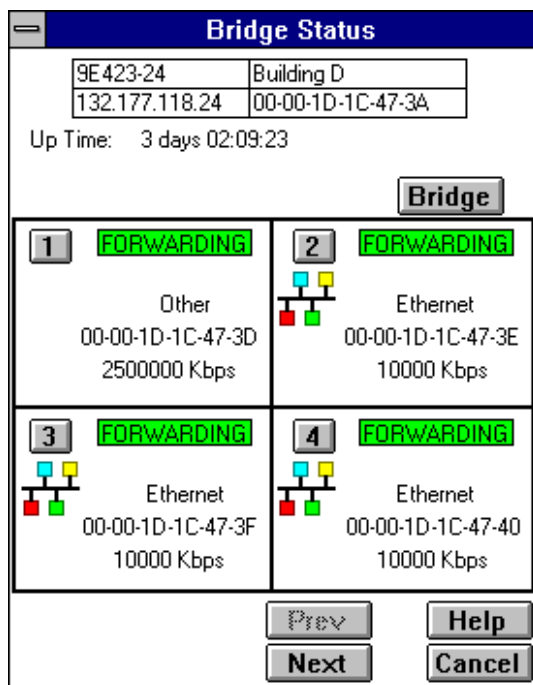


Figure 3-1. The 9E312/9E423 Module Bridge Status Window

Bridge Status Window Information Fields

The following information is provided by the Bridge Status window for the 9E312/9E423 Module and for each switch interface that supports bridging. Note that the **Prev** and **Next** buttons will be activated so that you can scroll the display to show all interfaces.

Up Time

At the top of the Bridge Status window, you can see the time period (in a days, hours, minutes, seconds format) that has elapsed since the 9E312/9E423 Module was last reset or initialized.

Bridge State on Interface

Indicates the state of bridging over the port interface. Possible bridge states and their corresponding colors are:

- Forwarding (Green) — The port is on-line and forwarding packets across the 9E312/9E423 from one network segment to another.
- Disabled (Blue) — Bridging at the port has been disabled by management; no traffic can be received or forwarded on this port, including configuration information for the bridged topology.

- Learning (Magenta) — The Forwarding database is being created, or the Spanning Tree Algorithm is being executed because of a network topology change. The port is monitoring network traffic, and learning network addresses.
- Listening (Magenta) — The port is not adding information to the filtering database. It is monitoring Bridge Protocol Data Unit (BPDU) traffic while preparing to move to the forwarding state.
- Blocking (Orange) — The port is on-line, but filtering traffic from going across the 9E312/9E423 from one network segment to another. Bridge topology information will be forwarded by the port.
- Broken (Red) — The physical interface has malfunctioned.

Interface Type

Indicates the interface type which applies to each 9E312/9E423 Module interface that supports bridging (i.e., Other for the INB interface, or Ethernet for the remaining interfaces). The interface type (ifType) is a mandatory object type from the SNMP MIB-II Interface (IF) Group.

Interface Address

Indicates the physical address of each switch interface that supports bridging.

Interface Speed

Indicates the data transmission speed supported by the interface (e.g., 10000 kbps for Ethernet).

Accessing Other Management Options from the Bridge Status Window

At the top of the Bridge Status window, you can click on **Bridge** to access a menu that provides other bridge management options:

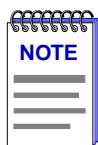
- **Spanning Tree...** which brings up a window allowing you to set the Spanning Tree Algorithm parameters for bridging on your 9E312/9E423 Module (see [Bridge Spanning Tree](#), following).
- **Disable/Enable Bridge**, which allows you to halt or start bridging across the device (see [Enabling and Disabling Bridging](#), following).
- **Performance Graph...** that brings up a window displaying statistics for traffic bridged across the module (see [Bridge Statistics](#), following).

You can also access a Performance Graph window and Statistics window for each individual interface by clicking on a port index button to display the port level management options (see [Bridge Statistics](#), following).

- **Filtering Database...** which invokes a window that lets you configure the 9E312/9E423 Module bridge's acquired and permanent filtering databases to filter or forward traffic across the 9E312/9E423 Module (see **Filtering Database**, following).
- **Duplex Modes...** which invokes a window that lets you configure an interface supported by the bridge to perform Ethernet full duplex switching (see **Duplex Modes**, following).

Enabling and Disabling Bridging

When you disable a bridge port, you disconnect that port's network from the bridge entirely. The port does not forward any packets, nor does it participate in Spanning Tree operations. Nodes connected to the network can still communicate with each other, but they can't communicate with the bridge and other networks connected to the bridge. When you enable a port, the port moves from the Disabled state through the Learning and Listening states to the Forwarding or Blocking state (as determined by Spanning Tree).



Enabling and disabling a port changes its Port Status, not its Port State. An enabled port is able to participate in bridging. A disabled port does not participate in bridging or Spanning Tree operations.

To enable or disable bridging at the port interface level from the Bridge Status window:

1. Click on the desired **Port** index (**1**). A pull-down menu will appear.
2. Click on **Enable** to restart bridging on the selected interface, or **Disable** to halt bridging across the selected interface. Note that you will receive a confirmation prompt before a port is disabled through management.

When you enable or disable bridging across the device, you simultaneously enable or disable bridging at all ports supported by the device. To enable or disable bridging at the device level from the Bridge Status window:

1. Click on **Bridge** to access the Bridge menu.
2. Click on **Enable Bridge** to restart bridging at the device level, or **Disable Bridge** to halt bridging across the entire device. Again, you will receive a confirmation prompt if you choose to disable bridging.

Bridge Statistics

The following sections describe Statistics windows available for the 9E312/9E423 Module bridge, both at the device and port levels.

Performance Graphs

You use the Bridge Performance Graphs to view a color-coded strip chart that shows you the traffic being bridged through all networks or an individual network supported by your device. You can configure the display to show bridge traffic (frames filtered, forwarded, or transmitted) — as well as the number of errors — experienced at the module level or at the interface level. Both the Bridge and Bridge Port graphs have an X axis that indicates the 60 second interval over which charting occurs continuously, while their Y axis measures the number of packets or errors that are processed by the 9E312/9E423 Module or its interfaces during bridging.

To access the device-level Bridge Performance Graph window:

1. From the Bridge Status window, click on **Bridge**. A pull-down menu will appear.
2. Click on **Performance Graph....** The 9E312/9E423 Module Bridge Performance Graph window, [Figure 3-2](#), will appear. (The individual Bridge Port Performance Graph windows are similar, except that they display a graph applicable to the selected interface.)

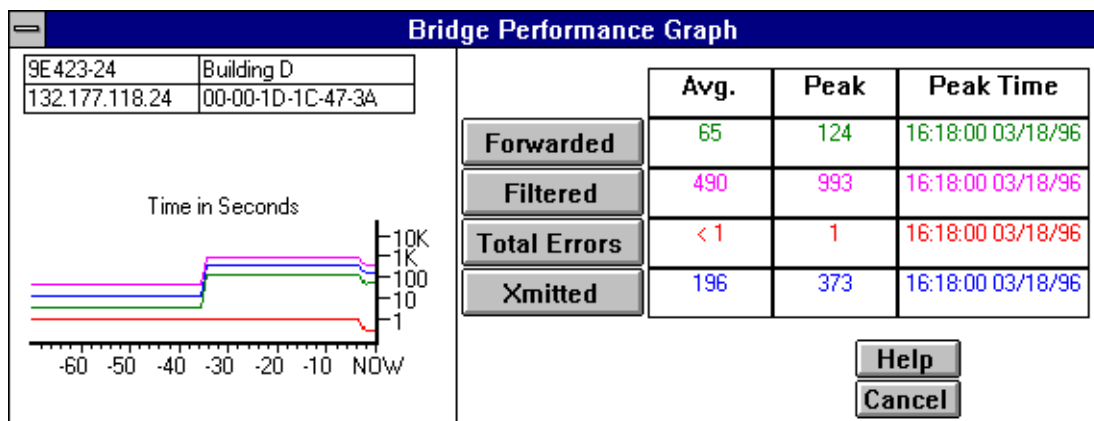


Figure 3-2. Bridge Performance Graph

To access the 9E312/9E423 Module Bridge Port Performance Graph window:

1. From the 9E312/9E423 Module Bridge Status window, click on the appropriate **Port** button (**1**). The port pull-down menu will appear.
2. Click on **Performance Graph....** The 9E312/9E423 Module Bridge Port Performance Graph window will appear.

Bridge Performance Graph Window Fields

You can select the following statistics to display in the Bridge Performance Graph or Bridge Port Performance Graph. Statistics are provided numerically (as an average or peak value) and graphically. The device is polled for the graphed information every 2 seconds, and numeric values are updated based on this poll.

The graph updates at the fixed two second interval. For the first 60 seconds of graphing, you will note the graph lines extending as each interval's data is added to the graph. Once the first 60 seconds has passed, the newest data is added at the right edge of the graph, and the oldest data is scrolled off to the left.

Peak statistics are based on the peak level of activity returned from a single poll since the Performance Graph window was invoked. A date and time is provided for peak levels.

The Average statistics are updated every 2 seconds as averaged over the previous four poll intervals (i.e., averaged over a sliding eight second time window).

Frames Forwarded (Green)

Forwarded The number of frames forwarded by the 9E312/9E423 Module's bridge, at the device or port level.

Nothing The Frames Forwarded function is currently not measuring any statistics.

Filtered (Magenta)

Filtered The total number of frames filtered by the 9E312/9E423 Module's bridge, at the device or port level.

Nothing The Filtered scale is not currently measuring the number of packets filtered by the bridge at the device or port level.

Errors (Red)

Total Errors The total number of errors that all bridging interfaces on the device, or an individual bridge interface, has experienced during bridging.

Nothing The Errors scale is currently not measuring any type of error packets coming through the device or port.

Xmitted (Blue)

Xmitted The total number of frames transmitted by the selected bridge interface, or all bridge interfaces.

Nothing The Xmitted scale is not currently measuring the number of packets filtered by the bridge or the individual interface.

Configuring the Bridge Performance Graphs

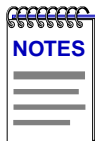
To configure the Bridge Performance Graph:

1. Using the mouse, click on **Forwarded** (with green statistics to the right). The Forwarded pull-down menu will appear. Click on the desired mode.
2. Click on **Filtered** (with magenta statistics to the right). The Filtered pull-down menu will appear. Click on the desired mode.
3. Click on **Total Errors** (with red statistics to the right). The Errors pull-down menu will appear. Click on the desired mode.
4. Click on **Xmitted** (with blue statistics to the right). The Xmitted pull-down menu will appear. Click on the desired mode.

The Performance Graph will now monitor the 9E312/9E423 Module's bridging process at the device or port level. Once you have selected a new mode, it will appear in its respective button, and after the next poll the Performance Graph will refresh and begin to measure using the new mode.

The Interface Statistics Window

You can use the Interface Statistics window to view information for each individual bridge port on your 9E312/9E423 Module. Statistics are provided for both transmit and receive packets at each port, as well as error and buffering information.



Because of the mismatch between the number of physical interfaces on the device and the number of interfaces performing bridging, the physical indexing of interfaces on both the 9E423 and 9E312 (the MIB-II ifIndex) does not match the indexing of ports with respect to the bridge.

For the 9E423, the Statistics window title bar for bridge port 2 (as labeled in the Bridge Status window) displays "Port 6"; for bridge port 3, it displays "Port 7," and so on.

For the 9E312, the Statistics window title bar for bridge port 2 (as labeled in the Bridge Status window) displays "Port 4"; for bridge port 3 it displays "Port 5" and so on.

A color-coded pie chart in the middle of the window lets you graphically view statistics for Unicast, Non-Unicast, Discarded, and Error packets.

To access the interface Statistics window:

1. Click on the individual bridge port index (**2**) to reveal the Port menu.
2. Choose **I/F Stats....** The following window, [Figure 3-3](#), will appear.

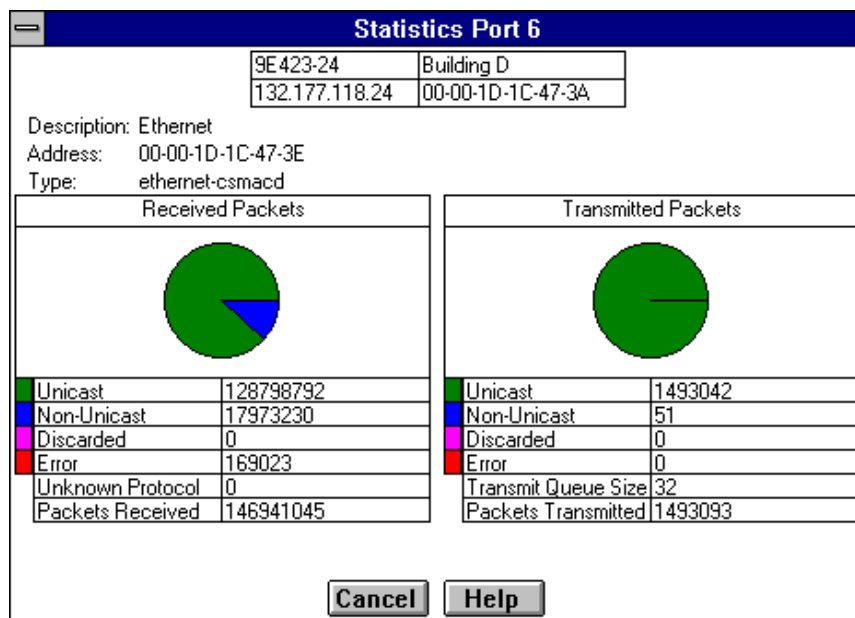


Figure 3-3. Interface Statistics Window

Interface Statistics Window Fields

The following informational and statistics fields appear in the interface Statistics window.

Three informational fields appear in the upper portion of the window:

Description

Describes the interface description (SNMP MIB-II ifDescription) for the currently selected port.

Address

Displays the MAC (physical) address of the selected port.

Type

Displays the interface type (SNMP MIB-II ifType) of the selected port.

The following transmit and receive statistics fields are displayed in the lower portion of the window. The first four statistics are also graphically displayed in the pie chart. The statistics are read directly from the device, and are updated with each poll from SPECTRUM Element Manager to the device.

Unicast

Displays the number of packets transmitted to, or received from, this interface that had a single, unique source or destination address. These statistics are displayed in the pie chart (color-coded green).

Non-Unicast

Displays the number of packets transmitted to, or received from, this interface that had a source or destination address that is recognized by multiple devices on the network segment. The Non-Unicast field includes a count of broadcast packets — those that are recognized by *all* devices on a segment, and multicast packets such as Bridge BPDUs — those that are recognized by a group of devices (but not necessarily all devices) on a segment. These statistics are displayed in the pie chart (color-coded dark blue).

Discarded

Displays the number of packets which were discarded even though no errors were detected to prevent transmission. One possible reason for discarding such a packet could be to free up buffer space.

Discarding good packets indicates a very busy network. If a device routinely discards packets, it usually means that network traffic is overwhelming the device, perhaps because the device is performing poorly.

These statistics are displayed in the pie chart (color-coded magenta).

Error

Displays the number of packets received or transmitted that contained errors. These statistics are displayed in the pie chart (color-coded red).

Unknown Protocol

Displays the number of packets received which were discarded because of an unknown or unsupported protocol. The 9E312/9E423 Module switch interface will discard the packet and increment this counter if it can't recognize the packet.

Packets Received

Displays the number of packets received by this interface.

Transmit Queue Size

The number of packets currently queued by the device for transmission from this interface. The amount of device memory devoted to buffer space, and the traffic level on the target network, determine how large the output packet queue can grow before the device begins to discard packets.

Packets Transmitted

Displays the number of packets transmitted by this interface.

Bridge Spanning Tree

The Bridge Spanning Tree window allows you to display and modify the 9E312/9E423's bridge port information and protocol parameters relating to the Spanning Tree Algorithm.

In a network design with multiple transparent bridges placed in parallel (i.e., attached to the same local network segment), only a single bridge should forward data through the LAN, leaving the remaining bridges on the segment in a standby state so that another can assume the bridging responsibility (should the currently active bridge go down). The Spanning Tree Algorithm (STA) is the method that bridges use to communicate with each other to ensure that only a single data route exists between any two end stations.

In Transparent bridging, Spanning Tree *must* be used to prevent data loops (since in an Ethernet environment, a packet propagated down multiple paths would cause higher volumes of traffic and collisions that would cripple a network that relied on carrier sense and collision detection). Spanning Tree selects a controlling Root Bridge and Port for the entire bridged local area network, and a Designated Bridge and Port for each individual network segment. The Root bridge is the one that selects one of two or more available bridge paths between two end stations, basing its decision on factors associated with each of the bridges in the path. A Designated Port/Bridge for a network segment relays frames toward the Root Bridge, or from the Root Bridge onto the network segment. When data passes from one end station to another across a bridged local area network, it is forwarded through the Designated Bridge/Port for each network segment towards the Root Bridge, which in turn forwards frames towards Designated Bridges/Ports on its opposite side.

During the Root Bridge selection process, all bridges on the network communicate STA information via Bridge Protocol Data Units (BPDUs). It is with BPDUs that the bridges collectively determine the current network topology and ensure that all bridges have current topology information.

To access the Bridge Spanning Tree window:

1. From the Bridge Status window, click on **Bridge**. A pull-down menu will appear.
2. Click on **Spanning Tree....** The Bridge Spanning Tree window, [Figure 3-4](#), will appear.

Bridge Spanning Tree																							
9E423-24	Building D																						
132.177.118.24	00-00-1D-1C-47-3A																						
Hello Time: 2		<input type="text" value="2"/>																					
Max Age: 20		<input type="text" value="20"/>																					
Forwarding Delay: 15		<input type="text" value="15"/>																					
Hold Time: 1		<input type="text" value="1"/>																					
Now Using <input checked="" type="checkbox"/> If this bridge is the root																							
Bridge Priority: <input type="text" value="8000"/>	Protocol																						
Root Bridge: 00-00-1D-14-F8-2F	<input checked="" type="radio"/> 802.1																						
Root Cost: 11	<input type="radio"/> DEC																						
Root Port: 1	<input type="radio"/> NONE																						
<table border="1"> <thead> <tr> <th>Port</th> <th>Priority</th> <th>Path Cost</th> </tr> </thead> <tbody> <tr> <td>Port 1</td> <td>80</td> <td>1</td> </tr> <tr> <td>Port 2</td> <td>80</td> <td>100</td> </tr> <tr> <td>Port 3</td> <td>80</td> <td>100</td> </tr> <tr> <td>Port 4</td> <td>80</td> <td>100</td> </tr> <tr> <td>Port 5</td> <td>80</td> <td>100</td> </tr> <tr> <td>Port 6</td> <td>80</td> <td>100</td> </tr> </tbody> </table>			Port	Priority	Path Cost	Port 1	80	1	Port 2	80	100	Port 3	80	100	Port 4	80	100	Port 5	80	100	Port 6	80	100
Port	Priority	Path Cost																					
Port 1	80	1																					
Port 2	80	100																					
Port 3	80	100																					
Port 4	80	100																					
Port 5	80	100																					
Port 6	80	100																					
<table border="1"> <thead> <tr> <th>Port 1</th> </tr> </thead> <tbody> <tr> <td>Priority: <input type="text" value="80"/></td> </tr> <tr> <td>Path Cost: <input type="text" value="1"/></td> </tr> <tr> <td>Designated Cost: 10</td> </tr> <tr> <td>Designated Root: 00-00-1D-14-F8-2F</td> </tr> <tr> <td>Designated Bridge: 00-00-1D-1D-1D-6F</td> </tr> <tr> <td>Designated Port: 8001</td> </tr> </tbody> </table>			Port 1	Priority: <input type="text" value="80"/>	Path Cost: <input type="text" value="1"/>	Designated Cost: 10	Designated Root: 00-00-1D-14-F8-2F	Designated Bridge: 00-00-1D-1D-1D-6F	Designated Port: 8001														
Port 1																							
Priority: <input type="text" value="80"/>																							
Path Cost: <input type="text" value="1"/>																							
Designated Cost: 10																							
Designated Root: 00-00-1D-14-F8-2F																							
Designated Bridge: 00-00-1D-1D-1D-6F																							
Designated Port: 8001																							
<p>Topology</p> <p>Changed 2 Times</p> <p>Last Changed On 03/15/1996 at 10:51:06</p>																							
		<input type="button" value="Set"/> <input type="button" value="Help"/> <input type="button" value="Cancel"/>																					

Figure 3-4. Bridge Spanning Tree Window

Configuring the Bridge Spanning Tree Window

The Bridge Spanning Tree window displays STA parameters and allows you to alter parameters for the 9E312/9E423 Module bridge as a whole, and for each individual bridging interface.

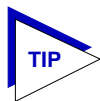
The currently selected bridging interface is highlighted in the lower right quadrant of the window. To alter the parameters of another interface, click on the appropriate **Port X** name listed in the quadrant.

Bridge Level Fields

Bridge Priority

This field displays the “priority” component of the 9E312/9E423 Module’s unique bridge identifier. The Spanning Tree Algorithm assigns each bridge a unique identifier, which is derived from the bridge’s MAC address and the Priority. The bridge with the lowest value of bridge identifier is selected as the Root. A lower priority number indicates a higher priority; a higher priority enhances a bridge’s chance of being selected as the Root.

You can edit this text box to change network topology, if needed. The range is 0-FFFF hexadecimal; the default value is 8000 hexadecimal.



Part of a bridge's Identifier is based on its MAC address. In most network installations, the difference between bridge performance may be negligible. You may, however, find your data bottle-necked in installations where both a low-performance bridge and a high-performance bridge are attached to the same LAN segment and the two (or more) bridges have the same Priority component set (e.g., at the default 8000 Hex). In such a scenario you may want to alter the Priority component of the higher performance bridge to ensure that it becomes root for the segment (or overall root). Remember, if Priority components are equal the bridge on the segment with the lowest Hex value of MAC address would have a better chance of being selected as the root bridge — as it would have a lower Bridge Identifier. If your bridges come from multiple vendors, they will have different MAC address values (e.g., Cabletron devices have a lower MAC address than 3Com devices); if they come from the same vendor, the bridge with the earlier manufacture date will be likely to have the lower MAC address value.

Root Bridge

Displays the MAC address of the bridge that is currently functioning as the Root Bridge.

Root Cost

Indicates the cost of the data path from this bridge to the Root Bridge. Each port on each bridge adds a “cost” to a particular path that a frame must travel. For example, if each port in a particular path has a Path Cost of 1, the Root Cost would be a count of the number of bridges along the path. (You can edit the Path Cost of bridge ports as described later.) The Root Bridge's Root Cost is 0.

Root Port

This field displays the identifier (the physical index number) of the 9E312/9E423 Module bridge port that has the lowest cost path to the Root Bridge on the network. If the 9E312/9E423 Module is currently the Root Bridge, this field will read 0.

Protocol

Displays the Spanning Tree Algorithm Protocol type the 9E312/9E423 Module is currently using. The choices are:

- 802.1
- DEC (DEC Lanbridge 100)
- None

The following four fields display values used for various Spanning Tree timers that are set at the Root Bridge and this bridge. In Spanning Tree operations, the value used for the tree is the one set at the Root Bridge (with the exception of Hold Time, which is a fixed value); but you can change the value for each bridge on your network in the event that it becomes Root.

Hello Time

This parameter indicates, in seconds, the length of time the Root Bridge (or bridge attempting to become the Root) waits before resending Configuration BPDUs. The range for this field is 1 to 10 seconds, with a default value of 2 seconds. The Root Bridge sets the Hello Time.

Max Age

This parameter displays the bridge's BPDUs ageing timer. This controls the maximum time a BPDUs can be retained by the bridge before it is discarded. During normal operation, each bridge in the network receives a new Configuration BPDUs before the timer expires. If the timer expires before a Configuration BPDUs is received, it indicates that the former Root is no longer active. The remaining bridges begin Spanning Tree operation to select a new Root. The current Root Bridge on the network sets the Max Age time. The range for this field is 6 to 40 seconds, with a default value of 20 seconds.

Forwarding Delay

This parameter displays the time period which elapses between states while the bridge is moving to the Forwarding state. For example, while moving from a Blocking to a Forwarding state, the port first moves from Blocking to Listening to BPDUs activity on the network, remains there for the Forward Delay period, then moves to the Learning State (and remains in it for the Forward Delay period), and finally moves into a Forwarding state. This timer is set by the Root Bridge.

During a topology change, the Forward Delay is also used as the Filtering Database Ageing Time, which ensures that the Filtering Database maintains current topology information.

Hold Time

This parameter displays, in seconds, the minimum time that can elapse between the transmission of Configuration BPDUs through a bridge port. The Hold Time ensures that Configuration BPDUs are not transmitted too frequently through any bridge port. Receiving a BPDUs starts the Hold Timer. After the Hold Timer expires, the port transmits its Configuration BPDUs to send configuration information to the Root. The Hold Time is a fixed value, as specified by the IEEE 802.1d specification.

Bridge Port Level Fields

The following fields are applicable to each bridge port on the 9E312/9E423 Module.

Priority

If two or more ports on the same bridge are connected to the same LAN segment, they will receive the same Root ID/Root Cost/Bridge ID information in Configuration BPDUs received at each port. In this case, the BPDUs Port ID information — the transmitting port's identifier and its manageable Priority component — is used to determine which is the Designated Port for that segment.

A lower assigned value gives the port a higher Priority when BPDUs are compared. The allowable range is 0-FF hexadecimal (0-255 decimal); the default is 80 hexadecimal.

Path Cost

Displays the cost that this port will contribute to the calculation of the overall Root path cost in a Configuration BPDU transmitted by this bridge port. You can lower a port's Path Cost to make the port more competitive in the selection of the Designated Port — for example, you may want to assign a lower path cost to a port on a higher performance bridge. The allowable range is 1 to 65535.

Designated Cost

Displays the cost of the path to the Root Bridge of the Designated Port on the LAN to which this port is attached. This cost is added to the Path Cost to test the value of the Root Path Cost parameter received in Configuration BPDUs.

Designated Root

Displays the unique bridge identifier of the bridge that is assumed to be the Root Bridge.

Designated Bridge

Displays the network address portion of the Bridge ID (MAC address/priority component) for the bridge that is believed to be the Designated Bridge for the LAN associated with this port.

The Designated Bridge ID, along with the Designated Port and Port Identifier parameters for the port, is used to determine whether this port should be the Designated Port for the LAN to which it is attached. The Designated Bridge ID is also used to test the value of the Bridge Identifier parameter in received BPDUs.

Designated Port


Displays the network address portion of the Port ID (which includes a manageable priority component) of the port believed to be the Designated Port for the LAN associated with this port.

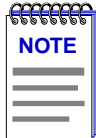
The Designated Port ID, along with the Designated Bridge and Port Identifier parameters for the port, is used to determine whether this port should be the Designated Port for the LAN to which it is attached. Management also uses it to determine the Bridged LAN topology.

Topology

This indicates how many times the bridge's Topology Change flag has been changed since the 9E312/9E423 Module was last powered-up or initialized. It also indicates the date and time at which the topology was last changed. The Topology Change flag increments each time a bridge enters or leaves the network, or when the Root Bridge ID changes.

Changing Bridge Spanning Tree Parameters


The Bridge Spanning Tree window allows you to update the following parameters for your 9E312/9E423 Module bridge. When you have finished making changes to the following individual parameters, you must click on  at the bottom of the Spanning Tree window to write the changes to the device.



Any values you set at the bridge will cause a Topology Change flag to be issued in the next Configuration BPDUs it transmits. This will cause the bridged network to immediately recalculate Spanning Tree and change topology accordingly.

Changing Bridge Priority


To change the part of the bridge address that contains the identifier used in the Spanning Tree Algorithm for priority comparisons:

1. Highlight the **Bridge Priority** field.
2. Enter the new identifier, in hexadecimal format; the allowed range is 0-FFFF hexadecimal.
3. Click on .

The selected Bridge Priority will be applied to the bridge (a lower number indicates a higher priority in the root selection process).

Changing the Spanning Tree Algorithm Protocol Type

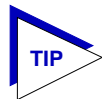
To change the type of protocol used in Spanning Tree:

1. Click the mouse on the appropriate option button: **802.1**, **DEC**, or **NONE**.
2. Click on .

The selected Spanning Tree Algorithm protocol type will be applied to the bridge. If you selected None, the Spanning Tree Algorithm will be disabled (if it already was enabled). If STA Protocol Type was changed from None to IEEE 802.1 or DEC, you must restart the bridge for the newly selected STA protocol to be applied.



All bridges in a network should use the same Spanning Tree version. Mixing Spanning Tree Algorithm protocols will cause an unstable network.



If your bridge is not in a parallel configuration, you should disable Spanning Tree at the bridge by turning it to None to reduce bandwidth consumption. Remember, Spanning Tree causes BPDU traffic to be propagated on the network by the bridge — even though there are no other bridges on the segment to receive those BPDUs.

Changing Hello Time

If the bridge is the Root Bridge, or is attempting to become the Root, and you want to change the length of time the bridge waits between sending configuration BPDUs:

1. Highlight the **Hello Time** field, and type in a new value.
2. Click on .

The IEEE 802.1d specification recommends that Hello Time = 2 seconds, with an allowable range of 1 to 10 seconds.

Changing Max Age Time

If the 9E312/9E423 Module is the Root Bridge or attempting to become the Root, and you want to change the maximum time that bridge protocol information will be kept before it is discarded:

1. Highlight the **Max Age** field, and type in a new value.
2. Click on .

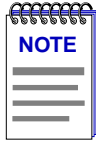
The IEEE 802.1d specification recommends that Max Age = 20 seconds, with an allowable range of 6 to 40 seconds.

Changing Forwarding Delay Time

If the 9E312/9E423 Module is the Root Bridge or attempting to become the Root, and you want to change the time period the bridge will spend in the Listening state (e.g. either listening to BPDU activity on the network while moving from the Blocking to the Learning state or in the Learning state while the bridge is moving from the Listening to the Forwarding state):

1. Highlight the **Forwarding Delay** field, and type in a new value.
2. Click on .

The IEEE 802.1d specification recommends that Forward Delay = 15 seconds, with an allowable range of 4 to 30 seconds.



To ensure proper operation of the Spanning Tree Algorithm, the IEEE 802.1d specification recommends that you always observe the following relationship between Forwarding Delay, Max Age, and Hello Time:

$$2 \times (\text{Forwarding Delay} - 1.0) \geq \text{Max Age} \geq 2 \times (\text{Hello Time} + 1.0)$$

Changing Port Priority

To change the part of the Port Priority used in priority comparisons:

1. If necessary, select the desired port by clicking the mouse to highlight the port in the lower right quadrant of the window. The lower left quadrant of the window will now allow you to edit parameters for the selected port.
2. Highlight the port **Priority** field, and enter the new priority identifier. Only valid hexadecimal numbers (0 to FF) are allowed in this field. The default is 80 hexadecimal.
3. Click on . The new port priority will be saved.

Changing Path Cost

To change the Path Cost:

1. If necessary, select the desired port by clicking the mouse to highlight the port in the lower right quadrant of the window. The lower left quadrant of the window will now allow you to edit parameters for the selected port.
2. Highlight the **Path Cost** field, and type in a new value from 1 to 65535 decimal (default is 100 decimal).
3. Click on .

The new path cost will be applied to the port.

Filtering Database

When the 9E312/9E423 switch is using Transparent Bridging, the Filtering Database, which makes up the IEEE 802.1d Source Address Table, is used to determine which frames will be forwarded or filtered between the 9E312/9E423 Module's bridging interfaces.

During initialization, a bridge copies the contents of its Permanent Database to the Filtering Database. Next, the bridge learns network addresses by entering the source address and port association of each received packet into the Filtering Database. When in the Forwarding state, the bridge examines each received packet and compares the destination address to the contents of the Filtering Database. If the destination address is located on the network from which the packet was received, the bridge filters (does not forward) the packet. If the

destination address is located on a different network, the bridge forwards the packet to the appropriate network. If the destination address is not found in the Filtering Database, the bridge forwards the packet to all networks. To keep Filtering Database entries current, older entries are purged after a period of time, which is called the Dynamic Ageing Time.

The **Filtering Database** consists of two separate databases: the Static and the Learned Databases.

The **Static Database** contains addresses that are entered by a network administrator. You add these addresses directly to the database while the bridge is powered up, or to the 9E312/9E423 Module's battery-backed RAM so that they are stored on shutdown till the next power-up.

The **Learned Database** consists of addresses that accumulate as part of the bridge's learning process as it is up and running. These do not remain in the Source Address Table when the system is shut down. The Learned Database also contains the addresses that are in the Static Database upon start-up of the bridge.

Entries to the Source Address Table are one of four types: **Permanent**, **Static**, **Dynamic**, or **Learned**.

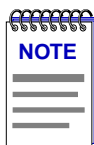
- **Permanent** entries are addresses that you add to the Static Database (via the Filtering Database window) that are stored in the 9E312/9E423 Module's battery-backed RAM. Since they remain in the device on shutdown or restart, they are considered "Permanent."
- **Static** entries are addresses that you add to the Static Database (via the Filtering Database window). These entries remain in the 9E312/9E423 Module until it is shut down.
- **Dynamic** entries are addresses that you add to the Static Database (via the Filtering Database window). With the Ageing Time feature, you set the time period that these addresses are saved in the Source Address Table. Addresses that have not transmitted a packet during one complete cycle of the ageing timer are deleted from the database.
- **Learned** entries are addresses that are added to the Learned Database through the bridge's learning process. With the Ageing Time feature, you set the time period that these addresses are saved in the Source Address Table. Addresses which are inactive within a cycle of the ageing timer are dropped from the database.

Learned address entries are divided into two types, **Learned** and **Self**. Address entries classified as **Learned** have transmitted frames destined for a device attached to a 9E312/9E423 Module port's connected segment. Address entries classified as **Self** are those that have sent a frame with a destination address of one of the 9E312/9E423 Module's bridging interfaces.

At the Filtering Database window ([Figure 3-5](#)), you can view the number of entries of each type: Permanent, Static, Dynamic, or Learned.

Filtering Database					
9E423-24	Building D				
132.177.118.24	00-00-1D-1C-47-3A				
List	Type	Number	Capacity	Ageing Time	
<input checked="" type="checkbox"/>	Permanent	0		Permanent	Clear
<input checked="" type="checkbox"/>	Static	0		On Reset	Clear
<input checked="" type="checkbox"/>	Dynamic	0		300	Clear
<input checked="" type="checkbox"/>	Learned	177			Read Only
Address	Type	Source Port	Receive Port (s)	Port Filtering	
00-00-1D-00-00-01	Learned	(1)			
00-00-1D-13-9E-02	Learned	(1)			
00-00-1D-07-CB-03	Learned	(1)			
AA-00-04-00-01-04	Learned	(1)			
00-00-1D-03-C0-06	Learned	(1)			
New Delete OK Cancel Help					

Figure 3-5. The Filtering Database Window



When you first initialize the Filtering Database window, a message will appear to inform you that data is being retrieved. The message will disappear when all information has been returned from the Filtering Database, and you will be able to view and configure database entries.

A scrollable Address Entry panel allows you to:

- View the address entries in the Filtering Database.
- Alter an entry's type (e.g., from Learned to Permanent, Dynamic, or Static).
- View and configure the bridging action taking place on the packets entering each of the bridging ports.

In addition, you can use buttons to add individual addresses to, or delete them from, these databases, or clear all Permanent, Static, or Dynamic entries in the database.

To access the Filtering Database window from the Bridge Status window:

1. Click on **Bridge**. The Bridge pull-down menu will appear.
2. Click on **Filtering Database....** The Filtering Database window will appear.

Filtering Database Window Fields

The following fields are listed in the top portion of the Filtering Database window.

List

The List checkboxes indicate whether the associated entry type (Permanent, Static, Dynamic, or Learned) will be displayed in the scrollable table of address entries. A check next to the entry type indicates that it will be displayed.

Type

Indicates the type of entry in the database.

Number

Displays the current number of Permanent, Static, Dynamic, and Learned Address entries.

Capacity

Indicates the total capacity of each entry type in the Static and Learned databases.

Ageing Time

Indicates the length of time, in seconds, that Dynamic and Learned Addresses in the Source Address Table are allowed to remain inactive before they are dropped from the database. The allowable time range for these entries is 10 to 1,000,000 seconds; the default is 300 seconds. Ageing time is not applicable to Static or Permanent entries. You can configure this field, as described in the next section.

The following fields are applicable to the scrollable Address Entry panel of Filtering Database entries.

Address

Lists the addresses for which the bridge's Filtering Database has forwarding and/or filtering information.

Type

Indicates the type of an entry in the database. The possible types are Static, Dynamic, Learned, Self, or Permanent. You can alter the entry type, as described in the next section.

Source Port

Indicates the port number on which the address entry was first detected. A question mark (?) indicates that the address entry was not a learned entry, but Port Filtering information applies to it (i.e., the entry is a created Permanent, Dynamic, or Static entry and has corresponding filtering information).

Receive Port

Indicates the number of the port on which a frame must be received in order for the entry's Port Filtering information to apply. This field will remain blank unless a Filtering Database entry has first been defined as being Permanent, Static, or Dynamic.

An asterisk (*) indicates that the receive port is promiscuous, and applies to all ports of the bridge (assuming no conflicting entry applies). You can change the receive port, as described in the following section.

Port Filtering

Indicates the action that will take place at each bridge port when it receives frames from the selected address entry. This field will remain blank unless a Filtering Database entry has first been defined as being Permanent, Static, or Dynamic.

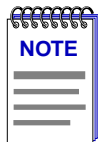
A green arrow indicates that the frames received from the address will be forwarded to the port's associated segment (➡¹). A red circle indicates that frames will be filtered (blocked) from the port's associated segment (●²). You can change the Port Filtering action, as described in the next section. (Note that port filtering is scrollable among all the potential ports; however, only two consecutive ports can be viewed simultaneously.)

Configuring the Filtering Database

You can configure the Filtering Database by:

- Altering the Ageing Time for Dynamic and Learned entries.
- Changing the type of entry with the Type buttons.
- Changing the Receive port for the filter.
- Changing the Port Filtering action at each bridge port.
- Adding or deleting individual Filtering Database entries.
- Clearing all Permanent, Static, or Dynamic entries from the Filtering Database.

Note that although configuration changes will appear in the window, no action actually takes place in the bridge's Filtering Database until you click on the **OK** button in the bottom right of the window. This saves the new configuration.



When you reconfigure the Filtering Database and click OK, the screen will clear temporarily and a message will appear to indicate that the information is being updated. When the changes have been successfully set and the Filtering Database has updated, the screen information will be refreshed.

If you change the window without clicking OK, then attempt to exit the window by clicking Cancel, a text box will appear stating “Changes have been made. Cancel them?”. Click on **Yes** to exit the window without changing the Filtering Database, or **No** to return to the window.

Altering the Ageing Time

To alter the Ageing Time for Dynamic and Learned entries:

1. Highlight the **Ageing Time** field with the cursor.
2. Type in the new Ageing Time (allowable range is 10 to 1,000,000 seconds; the default is 300 seconds).

Changing the Type of Entry

You can change any entry type from its current type (Learned, Self, Permanent, Static, or Dynamic) to either a Permanent, Static, or Dynamic entry. When you have changed the entry type, the Receive Port and Port Filtering fields will be activated so that you can change the filtering information for the entry.

To do change the type of entry in the Filtering Database:

1. Scroll through the address list until the entry appears for which you want to define filtering information.
2. Click on the shadowed **Type** button. A pull-down menu will appear with the three possible types to which the entry can be changed.
3. Highlight the desired type: **Permanent** (if you want the filtering information stored in the device's battery-backed RAM so that it remains even on shut down and power-up of the device), **Static** (if you want the filtering information only to be active until the device is shut down), or **Dynamic** (if you want the filtering information to be active only for the duration of the Ageing Timer).

Changing the Receive Port

You can change the Receive port of a Static, Permanent, or Dynamic address entry in the scrollable panel, so that a frame must be received at a specified port for the filtering action to apply. To do so, click on the **Receive** port in the panel. With each click, the Receive port will cycle to the next port (e.g., from promiscuous — *, to 1, to 2, to 3, to 4, to 5, and so on till the end of the interface stack, and then back to *).

Changing the Port Filtering Action

For a Static, Dynamic, or Permanent Filtering Database entry, you can change the Port Filtering action at each bridge port so that traffic with the associated source address will be filtered or forwarded at the port, as configured.

1. Scroll through the address list until the entry appears for which you want to define filtering information.
2. Maneuver the scroll bar until the port for which filtering action is desired displays in the Port Filtering panel.
3. Click on the port to alter its filtering action from forwarding frames from the associated source address (➔**1**) to filtering frames (●**2**) (or vice versa).

Adding or Deleting Individual Entries

You can add or delete static filtering entries individually from the Filtering Database.

To add an address:

1. Click on **New** in the lower left of the window. A window (Figure 3-6) will appear.
2. In the **Filter Address** field, type in the address (Hex format) for which you desire bridging. Be sure to add "-" as a separator between each byte in the address.

The image shows a dialog box titled "Filter Database - New Filter". It has two input fields: "Filter Address" with the value "00-00-00-00-00-00" and "Receive Port" with the value "0". There are three buttons: "Help", "OK", and "Cancel".

Figure 3-6. Filter Database — New Filter Window

3. In the **Receive Port** field, type in the port at which the address must be detected for bridging to take place. If you enter a value of 0 in this field, the Receive Port is considered promiscuous (i.e., any port), and will be designated by an * in the Address Entry panel.
4. Click on **OK**.

5. A Static filtering entry will be created in the database, which you can then configure as necessary.
 - a. Specify the **Type of Entry**, **Receive Port**, and **Port Filtering** action on the new address entry as described in the previous sections.
 - b. Click **OK** to set the changes to the Filtering Database.

To delete an address:

1. Click to highlight the address entry in the Address Entry panel that you wish to delete from the filtering database.
2. Click on **Delete**.

Clearing All Permanent, Static, or Dynamic Entries

To erase all Permanent, Static, or Dynamic entries from the Filtering Database, click on the associated button at the top of the window.

Using Port Source Addressing

You can use the Port Source Addresses window to view the MAC addresses that are communicating through a selected bridge interface.

To open the Source Addresses window from the Bridge Status window:

1. Click on the individual index () of the bridge interface of interest. The port pull-down menu will appear.
2. Select **Source Addressing...** The following window, [Figure 3-7](#), will appear.

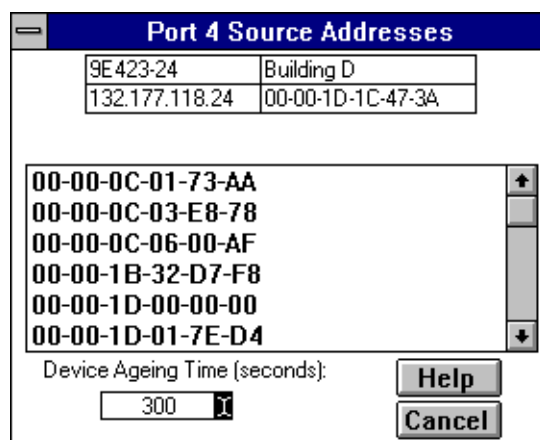
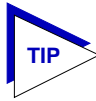
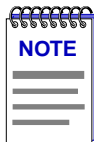


Figure 3-7. The Port Source Addresses Window



You can also open the Port Source Addresses window from the Module View by clicking on the front panel interface of interest and selecting the Source Addressing option from the menu that appears.

The Port Source Addresses window displays the MAC addresses of all devices that have transmitted packets that have been forwarded through the selected bridging interface during the last cycle of the Filtering Database's defined ageing timer (learned addresses that have not transmitted a packet during one complete cycle of the ageing timer are purged from the Source Address Table). For more information on the Filtering Database, see [Filtering Database](#) on [page 3-19](#).




The ageing time displayed in the Port Source Addresses window is the same as the ageing time displayed in the Filtering Database window. The ageing time can be set from either window, and any changes to its value will be reflected in both locations.

Setting the Ageing Time

The Filtering Database Ageing Time is user-configurable through the Device Ageing Time window.

To alter the Ageing Time for Dynamic and Learned entries:

1. Click the I-bar cursor () next to the Device **Ageing Time** field. The Device Ageing Time window, [Figure 3-8](#), will appear.

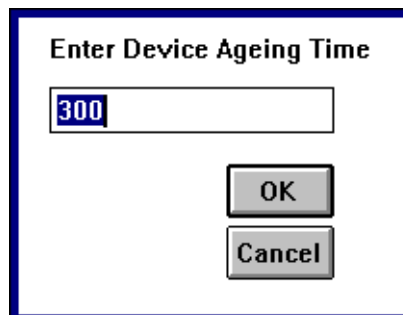




Figure 3-8. Device Ageing Time Window

2. Type in the new Ageing Time (allowable range is 10 to 1,000,000 seconds; the default is 300 seconds).
3. Click  to accept the new Ageing Time, or click  to exit the window without making changes.

Duplex Modes

The Ethernet switch interfaces on a 9E312/9E423 Module will support Full Duplex Switched Ethernet (FDSE) mode. Enabling Full Duplex mode on an interface allows the interface to receive and transmit packets at the same time. On an Ethernet connection that is not using full duplex mode, the interface can transmit *or* receive packets. The interface has to wait for one activity to be completed before switching to the next activity (receive or transmit). Using the full duplex mode allows for faster transmission for Ethernet connections.



*Full Duplex should **only** be enabled on an interface that has a connection to a single destination address at the other end of the connection (i.e., it is not a segment with an attached repeater cascading the connection to multiple destination addresses).*

Full Duplex mode disables the collision detection circuitry at the interface, so that both Transmit and Receive wires can be used simultaneously. With a single destination address at the other end of the connection (for example, if the connection was to a full duplex interface on another switching module, or if a single file server was connected to the full duplex switch port), this essentially doubles the available bandwidth from 10 Mbit/sec to 20 Mbit/sec. Note that the interface at the other end of the connection must also have Full Duplex enabled at the attached interface.

*Full Duplex mode **must** be disabled if the interface is communicating with multiple destinations simultaneously (i.e., if a repeater is cascaded from the interface), since Ethernet relies on Collision Sense for proper operation.*

The Duplex Modes Window

The Duplex Modes window allows you to enable/disable (turn on/off) Full Duplex mode capability for each bridging interface on your device. The window lists each interface on the device and whether Full Duplex is "ON" or "OFF."

To access the Duplex Modes Window from the Bridge Status window:

1. Click on **Bridge**. A pull-down menu will appear.
2. Click on **Duplex Mode....** The 9E312/9E423 Module Duplex Modes window, [Figure 3-9](#), will appear.

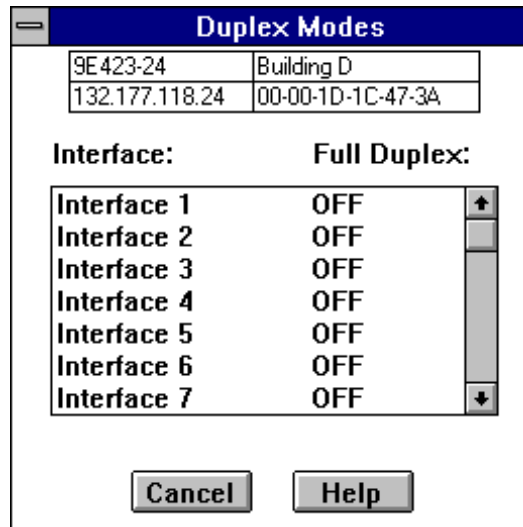


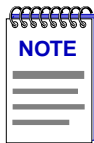
Figure 3-9. Duplex Modes Window

Duplex Modes Window Fields

The following information is displayed in the Duplex Modes window.

Interface:

Lists the interfaces available on the 9E312/9E423 Module.



Note that Duplex Mode should only be applied to the Ethernet switching interfaces (indexed 4 through 13 in the 9E312 Duplex Modes window; 6 through 29 in the 9E423-24 Duplex Modes window; and 6 through 41 in the 9E423-36 Duplex Modes window).

Full Duplex:

Displays the current state of Full Duplex on each interface. Possible values for this field are as follows:

- ON** Full Duplex Mode is being used on this interface.
- OFF** Full Duplex Mode is not being used on this interface.

Setting the Duplex Mode

You set an interface to use or not use Full Duplex Switched Ethernet by turning the Full Duplex capability ON or OFF from this window.

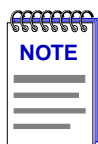
To turn the Full Duplex mode ON or OFF:

1. In the Duplex Modes window highlight the interface you want to change.
2. Double-click on the highlighted interface. The interface list will be briefly grayed-out as the set is being made to the device.

If the set is successful, the interface list will re-activate and the **Full Duplex:** indicator will switch from **ON** to **OFF** or **OFF** to **ON**.

If you attempt to set an interface to Full Duplex Mode that does not support this feature, you will receive a “Set Failed” error message.

Click on **Cancel** to close the window.



Because Full Duplex configuration takes place as you set each change individually, any changes that have been completed up to the point of clicking Cancel will have been set at the device. Make sure that you have undone any unwanted changes before exiting the window.

A

Adding Entries 3-25
 Address 3-10, 3-22
 Ageing Time 3-20, 3-22, 3-24

B

BLK (Blocking) 2-8, 3-5
 Boot Prom, revision 2-4
 Bridge Menu 2-6
 Bridge Performance Graphs 3-7
 configuring the graph 3-8
 Bridge Port Menu 2-7
 Bridge Priority 3-13, 3-17
 Bridge Protocol Data Units (BPDUs) 3-2, 3-12
 Bridge Spanning Tree
 Changing Parameters 3-17
 Bridge State on Interface 3-4
 Bridge Status window 3-3
 BRK 2-8, 3-5

C

Cancel button 1-5
 Capacity 3-22
 color-coded port display 2-2
 command buttons 1-6
 Connection Status 2-3

D

Date 2-4
 Deleting Entries 3-25
 Description 3-10
 Designated Bridge 3-12, 3-16
 Designated Cost 3-16
 Designated Port 3-12, 3-16
 Designated Root 3-16
 device date 2-10
 Device Menu 2-5
 Device Name 1-5
 device time 2-10
 Device Type 2-9
 DIS (Disabled) 2-7, 3-4

disable a bridge network 3-6
 Discarded 2-17, 3-11
 Duplex Modes Window 3-29
 Dynamic Ageing Time 3-20
 Dynamic entries 3-20

E

Error 2-17, 3-11
 Errors 3-8

F

Filtered 3-8
 Filtering Database 3-2, 3-19
 Configuring 3-23
 erasing all Permanent, Static, or Dynamic
 entries 3-26
 Learned Database 3-20
 Static Database 3-20
 Firmware
 revisions supported by management 1-7
 Firmware, revision 2-4
 Forwarding Delay 3-15, 3-18
 Frames Forwarded 3-8
 front panel display 2-1
 Full Duplex 3-29
 FWD (Forwarding) 2-7, 3-4

G

Getting Help 1-6

H

Hello Time 3-15, 3-18
 Help button 1-5, 1-6
 Help Menu 2-6
 Hold Time 3-15

I

I/F Summary
 interface performance statistics 2-14
 I/F Summary window 2-13

- accessing the Interface
 - Detail window 2-16
- interface description fields 2-13
- Interface 3-29
- Interface Address 3-5
- Interface Group window 2-15
 - statistics 2-16
 - testing or disabling an interface 2-18
- Interface Speed 3-5
- Interface Statistics Window 3-10
- Interface Type 3-5
- IP address 1-5, 2-3

L

- L. Sta 2-14
- Learned Database 3-20
- Learned entries 3-20
 - Learned type 3-20
 - Self type 3-20
- LIS (Listening) 2-8, 3-5
- List checkboxes 3-22
- Load 2-15
- Location 1-5
- LRN (Learning) 2-7, 3-5

M

- MAC address 1-5, 2-4
- Max Age 3-15, 3-18
- menu structure 2-4
- MIB components 2-8
- MMAC-Plus Chassis View 2-1
- Module Type 2-9
- Multicast 2-17

N

- Non-Unicast 3-11
- Number 3-22

P

- P. Sta 2-13
- Packets Received 3-11
- Packets Transmitted 3-11
- Path Cost 3-16, 3-19
- Permanent entries 3-20
- port display, color codes 2-2
- Port Filtering 3-23
- Port Filtering Action 3-25
- Port Number 1-5

- Port Priority 3-15, 3-19
- Port Source Addressing 3-26
- Port Status 2-4
- Port Status Display 2-7
- Protocol 3-14, 3-17

R

- Rate 2-15
- Raw Counts 2-14
- Receive Port 3-23, 3-24
- Root Bridge 3-14
 - selection process 3-12
- Root bridge 3-12
- Root Cost 3-14
- Root Port 3-14

S

- setting full duplex mode 3-30
- Source Address Table 3-19
 - Dynamic entries 3-20
 - Learned entries 3-20
 - Permanent entries 3-20
 - Static entries 3-20
- Source Port 3-23
- Spanning Tree Algorithm (STA) 3-2
- Spanning Tree Algorithm Protocol Type 3-14
- Spanning Tree Algorithm protocol type 3-17
- Static Database 3-20
- Static entries 3-20

T

- Technical Support 1-6
- Time 2-4
- Topology 3-16
- Transmit Queue Size 2-17, 3-11
- Type 3-10, 3-22, 3-24

U

- Unicast 2-16, 3-10
- Unknown Protocol 2-17, 3-11
- Up Time 1-5, 2-3, 2-13, 3-4
- Utilities Menu 2-6

X

- Xmitted 3-8